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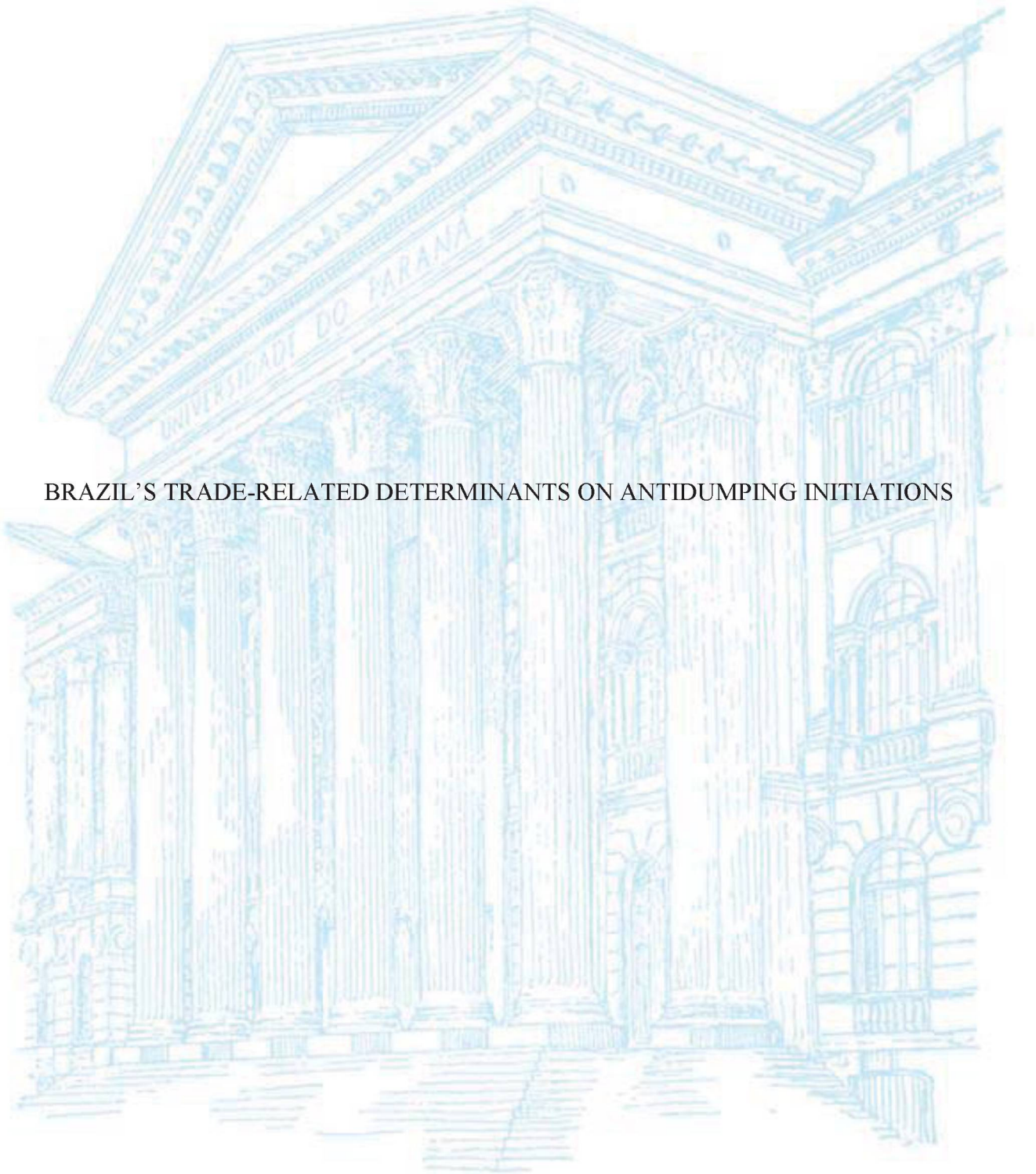

BRAZIL'S TRADE-RELATED DETERMINANTS ON ANTIDUMPING INITIATIONS

CURITIBA

2019

LUIS GUILHERME ALHO BATISTA

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Dissertação submetida como requisito parcial para obtenção do grau de Mestre, no âmbito do mestrado acadêmico em Desenvolvimento Econômico do Setor de Ciências Sociais Aplicadas da Universidade Federal do Paraná, Brasil.

Orientador: Prof. Maurício Vaz Lobo Bittencourt

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"O Brazil não conhece o Brasil, o Brasil nunca foi ao Brazil."

Maurício Tapajós e Aldir Blanc

RESUMO

Dumping é a prática de discriminação de preços internacionais caracterizada como um descumprimento ao princípio de não-discriminação, previsto no Acordo Geral sobre Tarifas e Comércio de 1994, do sistema internacional de comércio. O Brasil adotou poucas medidas antidumping até a década de 1990, quando a parcial abertura comercial e a aprovação de novas legislações de comércio incentivaram o aumento da aplicação dessas medidas. Porém, há incertezas no sistema de defesa comercial brasileiro causadas por falhas legislativas e de tomada de decisão, podendo ser ainda necessário reformá-lo nos próximos anos. Dessa forma, esse estudo é uma contribuição para o reforço ou o afastamento de ideias de reformas à Organização Mundial do Comércio e ao cenário institucional brasileiro de defesa comercial. Foram analisadas a existência e direção de possíveis influências de variáveis macroeconômicas sobre a abertura de investigações e revisões antidumping, delimitadas de forma bilateral em relação a todos os países que abriram investigações contra o Brasil ou que foram investigados por ele entre 1995 e 2017. Também foi feita uma discussão complementar sobre como o país se comporta, do ponto de vista de defesa comercial, em relação a parceiros comerciais desenvolvidos e emergentes. Os resultados foram obtidos a partir de modelos Poisson e Binomial Negativa e, para sanar preocupações referentes a sobre-dispersão, foram comparados resultados obtidos por um modelo Tobit. Os resultados apontam que o Brasil tende a iniciar mais investigações e revisões de antidumping contra parceiros comerciais que apresentam: (i) maior adição anual de valor industrial doméstico do que o Brasil; (ii) menor dependência comercial em relação às exportações brasileiras; e (iii) menores tarifas à importação impostas contra eles pelo Brasil. Esses resultados reforçam o argumento de que as políticas antidumping no Brasil não necessariamente são implementadas em um processo de combate a discriminações de preços, o que exige uma reforma nesse cenário para melhor aplicação dessas medidas.

Palavras-chave: Antidumping. Brasil. Modelos de Contagem.

ABSTRACT

Dumping is an international trade price discrimination characterized as a non-compliance practice with the General Agreement on Tariff and Trade 1994's non-discrimination principle of the trading system. Brazil has barely adopted any antidumping measures since the 1990's, when its application increased substantially because of trade opening and the signing of a new trade legislation. However, this legislation raises uncertainties on the local trade defense system decision-process; and the reforms to reduce as well as properly adjust antidumping measures application and legislation in Brazil may become even more necessary in the coming years. Therefore, this study provides contributions to reinforce or dispel ideas to reform both the World Trade Organization rules and Brazil's domestic trade policy institutional puzzle. We analyzed the existence and the direction of macroeconomic variables that might be influencing local antidumping policies decision-making, delimited by a bilateral study regarding all nations that filled antidumping investigations against Brazil or that where investigated by the Brazilian authorities between 1995 and 2017. We also made a complementary discussion concerning the country's behavior relating to developed and developing partners. We obtained our results by estimating Poisson and Negative Binomial models, and, to address concerns about over-dispersion, we compared these with a Tobit model. Results indicate that Brazil tends to open more antidumping investigations/revisions on trade partners that shows: (i) higher domestic industrial value added; (ii) lesser trade-dependency on Brazil's exports; and (iii) lesser tariff rates imposed against them by Brazilian authorities. These results reinforce the argument that antidumping policies in Brazil may not always be implemented within a price discrimination process, needing reforms on its institutional scenario in order to improve antidumping measures application by the country.

Key words: Antidumping. Brazil. Count data.

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LIST OF ACRONYMS

AD	– Antidumping
ADA	– Antidumping Agreement
BR	– Brazil
BRL	– Brazilian Real
CAMEX	– Brazil's Foreign Trade Chamber
DECOM	– Brazil's Department of Trade Defense
DSB	– Dispute Settlement Body
EU	– European Union
FE	– Fixed Effects
FOB	– Free on Board
GATT	– General Agreement on Tariff and Trade
GDP	– Gross Domestic Product
GNP	– Gross National Product
IMF	– International Monetary Fund
IMGRTH	– Imports Growth
IMSHR	– Imports Share
IRR	– Incidence-Rate Ratios
IVAGR	– Industrial Value Added
MDIC	– Brazil's Ministry of Industry, Foreign Trade and Services
MF	– Brazil's Ministry of Finance
MFN	– Most-Favored Nation
NB	– Negative Binomial Model
PCC	– Pearson Correlation Coefficient
RE	– Random Effects
TRBAL	– Trade Balance
TTB	– Temporary Trade Barriers
UN	– United Nations
USA	– United States of America
USD	– United States Dollar
WB	– World Bank
WDI	– World Development Indicators
WITS	– World Integrated Trade Solution
WTO	– World Trade Organization
ZI	– Zero Inflated

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1 INTRODUCTION

By the decade of 1990, Brazil had passed through a consolidation process of its legal standards on its international trade policy. This legal puzzle drawing at the end of the 21st century was a response to either the Marrakesh Agreement or the General Agreement on Tariff and Trade of 1994 (GATT 1994), that founded the World Trade Organization (WTO) (IRWIN, 1995).

The GATT 1994 was the last major worldwide trade agreement signed in the last century, also being the most recent[1] one on trying to globally promote foreign trade by reducing import tariffs and properly regulating other trade barriers, such as antidumping policies, one of the Temporary Trade Barriers (TTB) measures. This Agreement also aims to encourage policy-makers to adopt more technical-based decisions regarding protective policies (MDIC, 2018a; WTO, 2018a). Naturally, the expectation was that this new trade system would promote trades by, on average, reducing barriers, temporary or not, implemented between countries.

Globally, the weighted mean of imports tariff rates regarding all products traded between countries has been reducing since 1994 (WB, 2018a). However, the average number of worldwide annually TTB measures applications have been growing since that decade (AGGARWAL, 2004). Government's appeals and empirical studies regarding this inconsistency between the TTB policies increase and the GATT 1994 signing are controversial.

Based on the GATT 1994 motto, "governments claim that they use antidumping in response to unfair trade practices to level the playing field" (AGGARWAL, 2004, p. 1046). This argument makes sense when considering that TTB measures, such as antidumping, were drawn to prevent negative predatory effects of eventual price discriminatory conducts regarding foreign trade.

However, there are several studies indicating that factors unrelated to unfair trade practices, like economical and/or political, can be influencing the implementation of trade barriers (AGARWALL, 2004; CORDOVIL; OLARREAGA & VAILLANT, 2011; MARQUES, 2013; OLIVEIRA, 2014; FIRME et al, 2018). This brought to light a paradox

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[1] Since the Uruguay Round, ended in 1995 with the Marrakesh Agreement signature, no GATT round has finished. The current, Doha Development Round, has commenced in 2001 and its negotiations are in a breakdown since the late 2000's (Bouet and Laborde, 2017).

between what was planned on the legal standards, such as the GATT 1994, and what actually happened.

This inconsistency can also be verified on several countries. In Brazil, for example, besides the drops on the average tariff rates applied by the country in the last 20 years, antidumping measures, a TTB measure, were increasingly applied by the local authorities in the same period: antidumping measures (MDIC, 2018b; WB, 2018a).

Therefore, considering the existing loopholes in Brazil's TTB legal standards, in which the policy-maker has discretion at the adoption of trade defense measures (CORDOVIL, 2011; MARQUES, 2013), this research aims to empirically verify if there are any evidences that, in practice, the economic scenario and/or non-technical based factors are influencing Brazilian authorities' decision to initiate antidumping policies investigations and revisions.

To sum up, this study verifies the responsiveness of Brazil's antidumping policy investigations and revisions to changes on bilateral (regarding Brazil and their trade partners) macroeconomic conditions, mostly related to foreign trades. The main contribution of this study is providing more contributions to reinforce or dispel ideas that aim to reform both the WTO rules and the domestic TTB institutional puzzle.

These reforms become even more necessary in the coming years since, when inconveniently applied, antidumping rights can reduce domestic competition by restricting imports from investigated countries (NAIDIN, 1998; MIRANDA, 2003; SOUZA Jr, 2010; OLIVEIRA, 2014). This reduction can be a disincentive to local industry on adopting productivity improvement action, which has potential to frustrate plans on achieving sustainable economic growth in the country.

Brazil is facing losses on its capacity of growing because of higher public investment rates and is concomitantly passing through a population aging in its demographic transition, reducing its labor participation rate and increasing social security expenses (TINÉ, 2017; ANDRADE & ALBUQUERQUE, 2018). This leads to a higher importance on growing by productivity increases to support economic growth in the next decades. Therefore, policies with potential to negatively impact the productivity in Brazil, as, exacerbated, and unnecessary adoption of protective measures, tend to show even greater negative impact on Brazil's economic growth in the next few decades.

The geographical scope of our sample covers all nations that, since 1995, had its domestic industry investigated by Brazilian authorities or investigated Brazil's producers for dumping practices. In addition to the study of Brazil's behavior regarding antidumping

investigations/revisions against its trade partners, we also propose a complementary discussion concerning the country's TTB conduct relative to developed and developing partners separately. For that, we made two additional databases, one regarding Brazil's developing trade partners and the other regarding the emerging countries'. Results obtained by these additional databases are used in a comparative analysis with the regressions regarding all countries, in order to verify if there are any evidences of partiality by Brazilian authorities concerning the development status of the trade partner to be investigated.

Since current Brazil's antidumping legislation was sanctioned in 1995, this research covers data from 1995 until 2017, plotted as a panel-data. The chosen methodological approach assumes antidumping as a protectionist policy; that aims to reduce imports competition for the benefit of the domestic industry (AGGARWAL, 2004). Considering that antidumping measures are bilateral policies focused on specific markets, our response variables of interest can be classified as non-negative integer counts; the dependent variables are defined as the number of antidumping investigations and revisions yearly opened by the Brazilian authorities against each country's trade partners once investigated.

Using Negative Binomial and Poisson estimations, the sensitiveness of the dependent variables are tested against changes on bilateral macroeconomic conditions such as industrial value growth rate, tariff rates, trade balance, imports growth, and the number of antidumping measures applied to Brazil. We also estimated a left-censored Tobit estimation in order to, by comparing its results with others regressions, stave off concerns regarding over-dispersion in our sample.

This thesis is structured in six chapters, the first one being this introduction. The second one presents dumping and antidumping policies definitions and a brief explanation regarding the Brazilian trade defense institutional scenario. Chapter 3 contains a review of the empirical literature of antidumping determinants. Chapter 4 presents the methodology in what the empirical analysis is based on. Estimations results are shown and discussed on chapter 5. On the sixth, final considerations are made. Ultimately, the references cited along the text are listed, and appendixes and an annex of the work are presented.

2 DUMPING AND ANTIDUMPING POLICIES

Until 2017, three periods delimited the international legislation of antidumping: the first, from the beginning of the 20th century until 1947; the second period, from 1947 until 1994; and the last one, from 1994 until nowadays (CORDOVIL, 2009). The first one consisted on the approval of generics normative regarding TTB measures and ended with the signing of the original GATT.

The original GATT was signed in 1947 in order to, not exclusively, reduce trade barriers among its signatories (IRWIN, 1995). Among its content, the Agreement provided a general framework on the adoption of TTB measures by its signatories, which marks the beginning of the second period of antidumping legal history (CORDOVIL, 2009; MARQUES, 2013).

With the GATT in force, it was identified, on average, a worldwide reduction on international trade tariff rates (AGGARWAL, 2004). However, this reduction was followed by an increase on the imposition of TTB measures, mainly antidumping policies, by developed countries (AGGARWAL, 2004; WTO, 2018a). Thereby and since these measures did not have a clear procedure on their implementations by the time, some of the GATT signatories agreed on Codes in order to better regulate the adoption of TTB (CORDOVIL, 2009; WTO, 2018a).

The Kennedy Round Code (1960's) and the Tokyo Round Code (1970's) were the earliest attempts to do it[2]. But, despite of detailing the procedure to guide TTB policy-decisions, these normative had some controversial points that led to few practical acceptances between the parties to the Round Codes (WTO, 2018a). Also, these legal standards provided, at least for developing countries, "no more than a general framework for countries to follow in conducting investigations and imposing duties" (WTO, 2018a, not paginated).

Only The Uruguay Round of Multilateral Trade precisely specified and implemented the basic principles that currently rule the determination and application of TTB measures (AGGARWAL, 2004). This Round ended in 1994, when the Marrakesh Agreement, or GATT 1994 was signed, and changed substantially the original GATT, creating, based on its framework, the World Trade Organization (WTO) (IRWIN, 1995). In 1995, the year that the

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[2] Until 1994, the GATT was discussed in a total of eight Rounds, in which several themes concerning international trade, besides TTB, were discussed (MARQUES, 2013).

GATT 1994 was put in force, the third period of international antidumping legislation begun, which prevails until today (CORDOVIL, 2009).

Thenceforward, the GATT 1994 signatories engaged with a series of principles that currently rule the world's trading system. As summarized by WTO (2018b) and provided by GATT 1994, the trading system should be: (i) without discrimination[3]; (ii) freer; (iii) predictable; (iv) more competitive; and (v) more beneficial for less developed countries. Regarding TTB, GATT 1994 gathered a set of detailed standards concerning antidumping investigations, enforcement and dispute settlement (AGGARWAL, 2004).

2.1 DUMPING[4]

Dumping is an international trade price discrimination that generally occurs when the export price of a product is less than its supposed selling prince in the domestic market (MDIC, 2018a; WTO, 2018a). Hence, it is a non-compliance practice with the GATT 1994's non-discrimination principle of the trading system.

In its formal definition, according to the Agreement on Implementation of Article VI of GATT 1994[5], known as the Antidumping Agreement (ADA)[6], dumping is the "introduction of a product into the commerce of another country at less than its normal value"[7] (WTO, 2018c, not paginated). This practice can be harmful since, when domestic firms' production costs are higher than the reduced price, it can lead to the exit of those firms (BLONIGEN & PRUSA, 2016). A theoretical Cournot model concerning predatory dumping is given in Brander & Krugman (1983), known as the "Reciprocal Dumping Model"[8], explained below.

Suppose that there are two identical and separated countries, each one with distinct but identical firms that sell the same product on both domestic and foreign markets. Thus,

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[3] A trading system without discrimination gives its players an equally Most-Favored Nation (MFN) status, on which each of them should be treated virtually equally (WTO, 2018b).
[4] For the detailed history of international antidumping normative, see Cordovil (2009).
[5] Initially, dumping was defined on Article VI of the original GATT. Still, its definition was reformed until the development of the concept provided for by the GATT 1994 by the ADA, currently in use.
[6] The ADA was written based on several codes that had already established some procedures to antidumping investigation initiations: the Kennedy Round Code, also known as Agreement on Anti-Dumping Practices, and the Tokyo Round Code, for example (AGGARWAL, 2004; WTO, 2018a). This document establishes the current principles that governments are subjected to regarding investigations and applications on dumping and antidumping duties (WTO, 2018a, 2018c).
[7] Normal value is "the price of the product at issue, in the ordinary course of trade, when destined for consumption in the exporting country market" (WTO, 2018a, not paginated).
[8] The Reciprocal Dumping Model is fully described in Annex 1.

both countries have equal market demands and firms that have the same production costs. Also, there is a positive transportation cost over exports transactions paid by firms. Since both firms commercialize in both countries' markets, these transportation costs are feasible.

The profit maximization solution of the Cournot model gives us the same equilibrium prices in both markets. However, considering the additional export cost, prices of products that are sold domestically should be lower than the imported ones.

Therefore, besides being subjected to positive exports transportation costs in this case, firms charge the same price domestically and in the foreign country: these costs are not fully transferred to the importer, being cross-subsidized with an increase of prices domestically charged (SHY, 1996; BLONIGEN & PRUSA, 2016). This behavior leads each firm to "dump" prices charged in its foreign countries, giving the predatory "reciprocal dumping" behavior of these firms.

Still, to empirically verify the occurrence of dumping, according to GATT 1994, it is necessary to establish a fair comparison[9] between the export price and the normal value of like products (WTO, 2018a). These values are not always observable and can be subject to price distortions caused by, among other factors, market imperfections – as shown by exportations from non-market economies, where the home market prices may not be adequate to explain the normal value (WTO, 2018a).

For instance, if the observed price of a product on the exporting country market is less than its production cost, it will not correspond to the appropriate normal value of an antidumping investigation when: (i) below per unit total cost (both fixed and variable), plus administrative, selling and general ones; (ii) made in substantial quantities[10] within at least six months; and when (iii) not sustainable by the firm, not licensing appropriate costs recovery by firms within a period of time (WTO, 2018a, 2018c). This being the case, and if there is considerable volume of sales above cost, proper calculation of the normal value will be obtained when those sales are ignored (WTO, 2018a).

Otherwise, if sales in the exporting country are not in the ordinary course of trade, a proxy can be used to estimate the normal value. This can be based on the price of a like product from a third country or on its "constructed value", which considers production data to

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[9] According to the WTO, a fair comparison between export price and normal value occurs when "prices being compared are those of sales made at the same level of trade, normally the ex-factory level, and of sales made at as nearly as possible the same time" (WTO, 2018a, not paginated).

[10] Sales are considered to be made in substantial quantities if: "the weighted average selling price is below the weighted average cost; or (b) 20% of the sales by volume were below cost" (WTO, 2018a, not paginated).

estimate the value (WTO, 2018a). A "constructed price" can also be estimated for the export price, when it is unreliable[11] or does not exist (WTO, 2018a, 2018c).

However, when facing markets with different elasticity of demand, firms may charge different prices in each market, even when selling the same good that was produced based on the same costs. On this account, besides their production cost, firms can also consider market conditions when making price decisions (BLONIGEN & PRUSA, 2016).

Suppose that a single firm domestically sells a product in its country *p*, and also exports to Brazil (*b*). Assuming profit maximization, constant and positive marginal costs of production (*c*), that the firm faces the domestic demand Q_p, and that the Brazil's market demand is given by Q_b:

$$Q_p = a - P_p;\ a > 1, \tag{1}$$

$$Q_b = 1 - P_b, \tag{2}$$

we can show that (BLONIGEN & PRUSA, 2016):

$$P_p = (a + c)/2 > (1 + c)/2 = P_b. \tag{3}$$

To sum up, when market imperfections lead to a higher market power in the domestic country than in the foreign one, the profit maximization firm can practice dumping in its rational price-decision process (BLONIGEN & PRUSA, 2016). In this case, this price discrimination may not be predatory.

However, besides the market features that may or may not imply on non-predatory dumping, its practice by a signatory country of WTO's agreements can be characterized as a trade principle's disobedience, which, by GATT 1994, needs compensation policies in order to ensure free trade between its members.

2.2 ANTIDUMPING MEASURES

As established on GATT 1994, countries can impose antidumping measures to protect their domestic industries[12] from dumping's price discrimination when concomitantly identified: (i) direct proof of dumping conduct by the exporting firm(s); (ii) material injury

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[11] The export price may be unreliable when influenced by agreements involving the importer and/or the exporter (WTO, 2018a).

[12] As on article 4 of the ADA, domestic industry is "the domestic producers as a whole of the like products or those of them whose collective output of the products constitutes a major proportion of the total domestic production of those products" (WTO, 2018c, not paginated).

suffered by the like product[13] sellers in the domestic industry; and (iii) causal link between the practice of dumping and the material injury (WTO, 2018a, 2018c). Moreover, each WTO member, based on these agreements and codes and on its institutional puzzle, establishes its own internal rules on dumping determination and duties implementation.

The necessity of finding this causal link to adopt antidumping measures lies on the possibility of dumping being harmless to the domestic industry, such as the non-predatory dumping case specified by Blonigen and Prusa's (2016) theoretical model. However, studies found that most antidumping measures have been applied without being identified market conditions needed for practicing price discrimination (BLONIGEN & PRUSA, 2016).

Measures are always applied with a pre-determined termination date, that should be later than five years from its imposition (WTO, 2018c). However, despite this temporary nature of antidumping measures, article 11 of the ADA prevails that "an anti-dumping duty shall remain in force only as long as and to the extent necessary to counteract dumping which is causing injury" (WTO, 2018c, not paginated). In this way, trade authorities can review duties near their termination date in order to determine if there is still evidence of dumping practice by the investigated country. If proven that the revised duty termination could recur in injury to the domestic industry, a country can reinforce it for more five years.

Yet, as further developed on this study, antidumping investigations and revisions criteria regarding injury and causal link measurement and determination can be subjective, leaving room for applying the TTB measure when predatory practice conditions are not necessarily fulfilled. Facing this possibility, each WTO member needs to regularly notify their antidumping legislation to the WTO's Committee on Antidumping Practices, in order to discuss with other WTO members, and reviews its terms in order to approve it or not (WTO, 2018a). They have to notify the Committee with information about its antidumping initiations and actions, which have its legal conformities subjected to semiannually revisions (WTO, 2018a). Also, in order to avoid irregular implementation of antidumping policies, WTO members can also appeal to the WTO's Dispute Settlement Body (DSB) into challenging antidumping measures applied by other members (WTO, 2018a).

Still, this kind of transparency policies are relatively new since countries were not required to notify international organizations data regarding their TTB policies until the 1980s

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[13] As on article 2.6 of the ADA, like product is "a product which is identical, i.e. alike in all respects to the product under consideration or, in the absence of such a product, another product which, although not alike in all respects, has characteristics closely resembling those of the product under consideration" (WTO, 2018c, not paginated).

(AGGARWAL, 2004). Thereby, studies in this field are subjected to restraints concerning data availability (which may be an obstacle to methods that require long time-series) (AGGARWAL, 2004).

With the adoption of these stricter rules by signing the GATT 1994, and with the implementation of more austere criteria to prove dumping, injury and causal link, a reduction on antidumping was expected on the countries that applied it (AGGARWAL, 2004, p. 1045). But since the 1990's, the number of TTB investigations opened and measures applied by the Brazilian authorities rapidly increased. In order to understand this scenario, a brief explanation regarding Brazil's antidumping history, of normative and applying-process is needed.

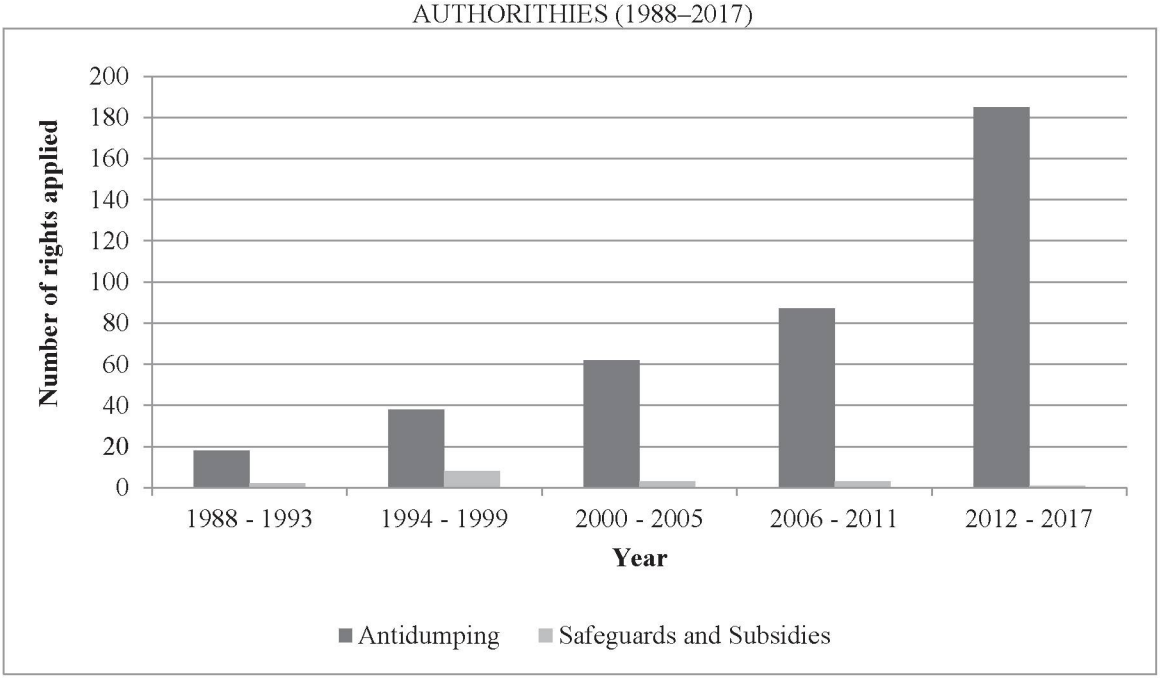
2.3 BRAZIL'S ANTIDUMPING INSTITUTIONAL PUZZLE

At least by the end of the 20th century, it was registered a worldwide antidumping dominance over the other two Temporary Trade Barriers measures implemented. Among WTO members, antidumping represented 89.1% of TTB measures implemented between 1995 and 2000 (AGGARWAL, 2004, p. 1043).

Regarding Brazil's scenario, between 1988 and 2017 [14], Brazilian authorities implemented 33 subsidies and safeguards measures against its trade partners, despite of the 390 antidumping rights applied on the same period (MDIC, 2018b). As shown on Figure 1 below, the number of subsidies and safeguards measures applied by Brazil is irrelevant when compared with the antidumping ones (OLARREAGA & VAILLANT, 2011).

[14] The introductory analysis was narrowed to this data range in order to avoid selection bias, since before 1980 the report of protection actions by countries was not mandatory, and that there is low availability of data for Brazil TTB initiations after 1988, (AGGARWAL, 2004).

FIGURE 1 – NUMBER OF TOTAL TTB MEASURES SEXENNIALLY APPLIED BY THE BRAZILIAN AUTHORITHIES (1988–2017)



SOURCE: elaborated by the author, based on MDIC (2018b).

Safeguards and subsidies are more frequently implemented by large industrialized/developed countries or economic unions (BOWN & CROWLEY, 2013). In that way, regions such as the United States of America (USA) and the European Union (EU) have a longer history of using TTB measures than the developing countries (AGGARWAL, 2004; ZANARDI, 2006).

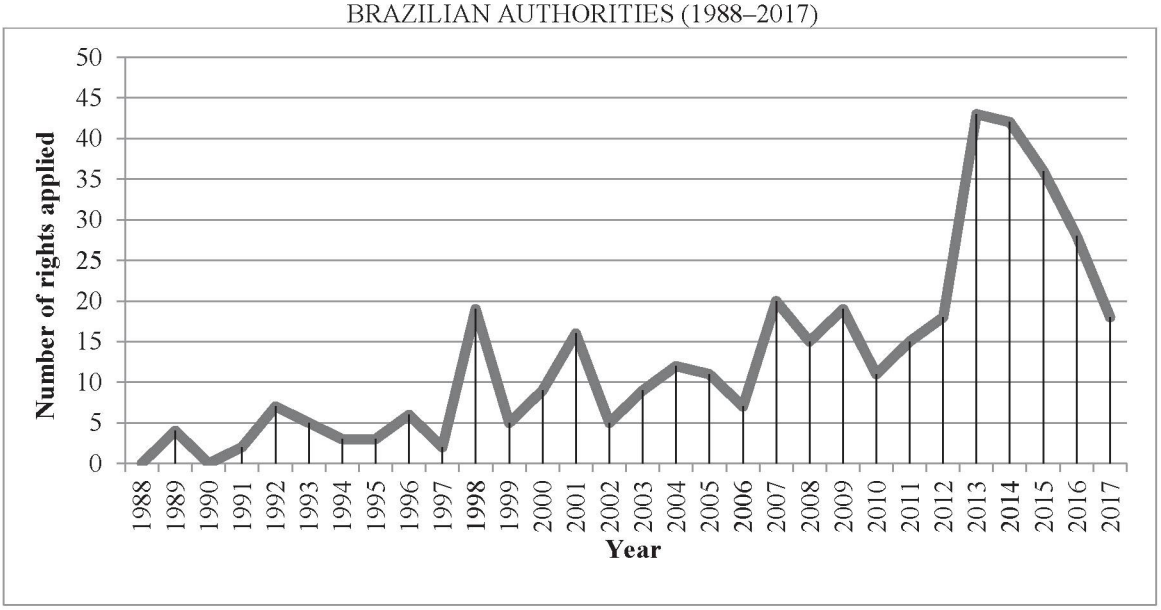
Paradoxically, despite being the most used TTB policy, antidumping rights are the most limited measure between all three temporary ones. Safeguards policies, for instance, are barriers that comprehend all imports of a determined product concerning any trade partner. However, why do governments choose to apply a limited TTB measure, when WTO legislation provides for a nondiscriminatory one? One reasonable answer would be because antidumping measures application are cheaper and faster.

On the other hand, safeguards "are subject to more stringent conditions in terms of prerequisites and compensation" (AGGARWAL, 2004, p. 1046). Therefore, as shown on Figure 1, and considering the small and decreasing number of other TTB measures adopted by the Brazilian government since 1994, only antidumping policies will be considered for this study.

As previously explained, a reduction on antidumping filings and applications was expected by the implementation of the GATT 1994. However, as seen on the former Figure, Brazil's barely initiated antidumping measures until then, when, since the 1990's, its

application increased substantially. This counterintuitive movement can also be verified on Figure 2 below.

FIGURE 2 – NUMBER OF TOTAL ANTIDUMPING MEASURES ANNUALLY APPLIED BY THE BRAZILIAN AUTHORITIES (1988–2017)



SOURCE: elaborated by the author, based on MDIC (2018b).

Yet, this change of course on antidumping application by the 1990's was not exclusively a Brazilian case. Several other developing countries also became users of antidumping measures at the end of the 20th century; a mechanism that until then was mostly applied by developed ones (AGGARWAL, 2004; ZANARDI, 2006; CORDOVIL, 2009; OLARREAGA & VAILLANT, 2011; BOWN & CROWLEY, 2014). The factors that explain this increase on the application of antidumping rights after the 1990's regarding the Brazilian authorities are summarized below, divided between macroeconomic and legal factors.

2.3.1 Macroeconomic Factors – Partial Trade Liberalization, Monetary Exchange Parity with USD and Economic Expansion

The last ten years of the 20th century were marked by constant changes on Brazil's international trade policy (DORNBUSCH, 1992; SALLUM JR., 1999; VEIGA, 2017). The country's economy was predominantly closed until 1991, when the economic package *Plano*

Collor[15] was put in force, and some partial trade liberalization policies that still rule were implemented (SALLUM JR., 1999; VEIGA, 2017).

But Brazilian imports have vertiginously grown only after *Plano Real*[16], a more effective economic package, was implemented (SALLUM JR., 1999; OLARREAGA & VAILLANT, 2011). From 1994 until 1999, the Brazilian Real (BRL) was in parity with the United States Dollar (USD) (CORDOVIL, 2009). The currency appreciation and the economic package brought a reduction of foreign products relative price and, thereafter, an increase in local economic activity, by higher consumption levels, and in the quantity of Brazilian imports (SALLUM JR., 1999; CORDOVIL, 2009).

The trade liberalization, reductions on tariffs, and currency parity all by the 1990's, allowed an increase on imports by the end of the 21st century, making it possible for Brazil to experience international price discrimination (if a country does not trade with others, it cannot undergo noncompliance practices from its partners) (OLARREAGA & VAILLANT, 2011). So, since imports are a necessary condition on being harmed by international practice, there is an indirect and expected positive correlation between imports and antidumping measures applications.

In the Brazilian case, this relation between the increase of imports since the 1990's and the applied antidumping rights can be verified on Figure 3.

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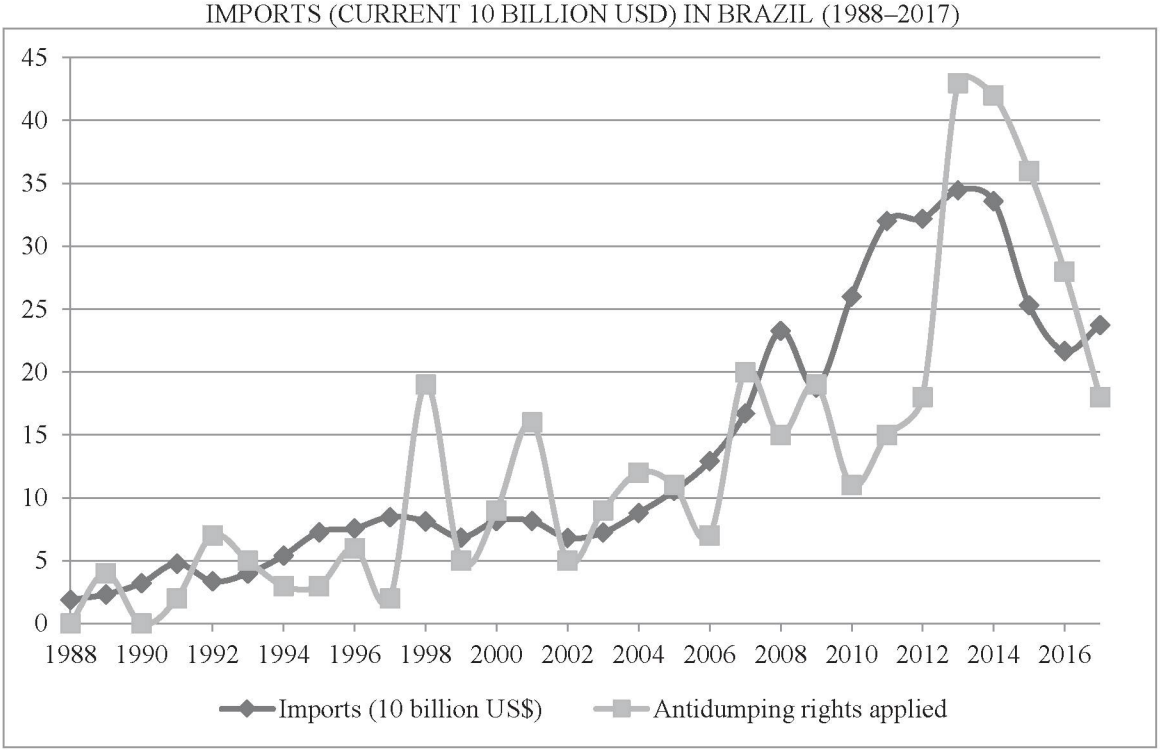
[15] *Plano Collor* was the economic package by which the Brazilian government implemented an economic reform that, among its policies, "adopted a moderately ambitious unilateral trade liberalization policy. This movement was complemented by the consolidations of maximum Tariff for industrial and agricultural goods by the WTO and the establishment of Southern Common Market's (MERCOSUR) customs union." (VEIGA, 2017, p. 1).

[16] By the economic package *Plano Real*, a series of economic policies was implemented in Brazil in order to achieve domestic macroeconomic stabilization. Among them, the BRL was maintained appreciated for approximately five years (SALLUM JR., 1999).

FIGURE 3 – RELATION BETWEEN TOTAL OF ANTIDUMPING RIGHTS ANNUALY APPLIED AND IMPORTS (CURRENT 10 BILLION USD) IN BRAZIL (1988–2017)



SOURCE: elaborated by the author, based on MDIC (2018b) and on The World Bank (WB) (2018a).

From the series format on Figure 3, it is possible to suspect that there may be a lag behavior between imports and antidumping policies. Using the same database from the graph and calculating the Pearson Correlation Coefficient (PCC)[17] between the chart series, it is confirmed that a one-year lag of imports has a larger association with antidumping policies than when they are not lagged. This lag also has a best fit to the correlation than lagging the variable on larger periods, as numerically shown on Table 1 below[18].

TABLE 1 – PEARSON CORRELATION COEFFICIENT BETWEEN APPLIED ANTIDUMPING RIGHTS AND LAGGED IMPORTS: BRAZIL (1988–2017)

Imports variable lag (by year)	Correlation with antidumping policies
1	70.27%
0	79.91%
-1	**86.43%**
-2	86.07%
-3	81.44%

SOURCE: elaborated by the author, based on MDIC (2018b) and on The World Bank (WB) (2018a).

[17] Usually, cross-correlation functions are more appropriate to capture the correlation coefficient of time-series than the PCC, which is a simpler method. Thus, its use is appropriate for the presented case since this is a mere comparative analysis between correlations, which disregards the coefficient's magnitude.

[18] This correlation analyses implies on loss of degrees of freedom at the same value, in module, of the years of lag imposed on the variable. For example: when imports are lagged in one year, we lost one degree of freedom of our sample.

Discussions concerning this lagged-relation between imports and antidumping policies are posteriorly resumed, on the methodology section.

2.3.2 Legal Factors – The Brazilian Antidumping Authorities Institutionalization

Other main factor that caused an increase on Brazil's antidumping initiations in the 1990's was the approval of local trade defense legislation in 1995, when the country's main legal standard to domestically regulate antidumping was sanctioned (PIANI, 1998). This was a direct consequence of the implementation of the GATT 1994 because, besides the stricter rules implemented by it in order to better regulate the adoption of TTB, the Agreement was the main contribution to the local legislation discussions (ZANARDI, 2006).

After local's TTB legislation sanction, a political group organized by the domestic industry has emerged in order to pressure the government to apply antidumping measures more often (CORDOVIL, 2009). "This pressure resulted in the creation of a federal bureaucracy trained to investigate antidumping and subsidies" (CORDOVIL, 2009, p. 32, own translation).

One of the organizations created on this new institutional scenario is the Brazil's Department of Trade Defense[19] (DECOM, in its acronym in Portuguese). This authority is responsible for, regarding TTB: (i) analyze requests for investigations by domestic industry; (ii) propose and conduct investigations; (iii) recommend the application of the measures; (iv) be aware of the discussions about legal procedures on WTO; (v) participate in international negotiations; and (vi) be well informed on the investigations opened by trade partners against Brazilian exporters (MDIC, 2018c). Therefore, DECOM is the responsible for estimating presumable dumping against the domestic industry and investigating the existence of consequential injury suffered by it.

Notwithstanding, DECOM does not have the authority to open investigations and apply TTB measures, but only recommend them. This responsibility falls to the Brazil's Foreign Trade Chamber Board (CAMEX, in its acronym in Portuguese) of Brazil's Presidency (MDIC, 2018d). CAMEX's board is formed by six Ministers of State, the President of Brazil, and one of his Executive Secretaries (MDIC, 2018d).

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[19] DECOM is one of the departments of The Secretariat of Foreign Trade (SECEX, in its acronym in Portuguese), that is allocated on the Ministry of Industry, Foreign Trade and Services (MDIC, in its acronym in Portuguese) (MDIC, 2018c).

The ADA, on its fifth article, establish that requests[20] submitted by or on behalf of a substantial share of domestic industry should base investigations of antidumping measures, unless trade defense authorities already have sufficient evidence to open an investigation by itself (WTO, 2018a, 2018c). So, in Brazil, CAMEX can also open new investigations of office when in possession of palpable information to substantiate it.

All data considered crucial for the analyses must have its veracity verified by local antidumping authorities and must remain confidential when considered sensitive to the domestic or the foreign industry, unless when its partial or full disclosure promotes more transparency on the investigation proceedings (WTO, 2018a, 2018c). When the initiation request sent by parties of the domestic industry does not provide the best data available in order to open an investigation, DECOM can ask for complementary information from interested and involved parties (WTO, 2018a, 2018c).

These investigations must be completed on the following 18 months after their initiation, unless it is considered without merit, when, in order to avoid more disruptions on trade course, they must be immediately terminated (WTO, 2018a, 2018c). Brazil follows a WTO recommendation that an investigation bases dumping estimations on prices of at least six months before it and, preferentially, of the year before. These deadlines explain the one-year-lag behavior between imports and the adoption of antidumping policies, previously introduced on Table 1 (MDIC, 2018a; WTO, 2018a).

Thus, DECOM is responsible for, at the same time, investigating dumping indications that are in course against Brazil's domestic industry, and monitoring/revising the course of trade defense investigations opened against the country. Therefore, the same department that initiates investigations against Brazil's trade partners is the one that keeps up with and revises those investigations that are opened by them. This overlap of functions can be a problem on the TTB decision-making, since there is an ordinary high risk of upward bias in dumping calculations by the government (AGARWALL, 2004). In this sense;

> "[...] any bias in the adjustments *[of dumping determinants]* may cause bias in the dumping calculations as well. [...]. It may not always be possible to use the actual information on normal and export prices and the investigating authorities may have to construct them [...]. **The risk of upward bias in dumping calculations is therefore very high.** [...]. Governments favor protectionist interests. There could be several reasons for this such as, political concerns, equity concerns or trade patriotism. Oligopolists may also pressurize them to grant protection from import competition by lobbying effectively. **From the governments' perspective, the AD law provides a politically low-visibility, nontransparent protection tool for**

[20] Those requests must have evidence of dumping, consequential injury, and general industry, product and trade data (WTO, 2018a).

> **responding to protectionist demands by domestic producers.** AD practices are targeted at firms not governments (unlike countervailing duties) and are therefore not required to be imposed on a most-favored country basis (unlike safeguard measures). **Hence governments readily tend to support the use of the GATT-compatible AD mechanism**." (AGGARWAL, 2004, p. 1046, emphasis added).

Another example of institutional insecurity regarding the Brazilian authority antidumping application-process is that, when estimating injury to the domestic industry while on a dumping investigation, DECOM can freely decide which market elements will be used and which ones will be disregarded (CORDOVIL, 2009). This is a legal loophole on Brazil's antidumping legislation that allows the use, by the authority, of specific data that can imply greater or lower injury estimation (MARQUES, 2013).

In the general context, it is possible to identify ambiguous results regarding injury and causal link estimation, with some indicators showing industry harm and other presenting negative results (AGGARWAL, 2004). In this case, choosing which indicators best fit the injury and causal link analysis is necessary. However, this is a subjective decision, which can bias the procedure of determining if an antidumping measure should be applied (AGGARWAL, 2004).

In order to avoid a reckless antidumping application, the ADA states that the decision of applying the measure is up to the domestic authority, even when the criteria to determine it is already fulfilled by the economic indicators (CORDOVIL, 2009). Although it is designed to provide legal security to the process, this empowers governments with the possibility to arbitrarily foreclose the adoption of an antidumping policy.

In addition to this, the Brazilian legislation defines that the application of these measures can be restrained by CAMEX if the authority considers that there is public interest of its foreclosure (MINISTRY OF FINANCE [MF], 2018). Between 2015 and half of 2018, 7.7% of Brazil's investigations passed through public interest analysis and 4.4% of applied antidumping measures were or modified or foreclosed under this prerogative (MF, 2018).

Therefore, in order to be sure that the application of antidumping rights properly represents public interest, CAMEX generally verifies if the measure could cause negative impact on, among others: (i) domestic competition (such as prices and mobility of goods and factors); (ii) national industrial and technological development; (iii) unemployment rate; and (iv) wage levels (MARQUES, 2013). But, even with these criteria, because of the multiplicity of interpretations derived from what "public interest" really means, the mechanism of foreclosing an antidumping measure is not well defined (CORDOVIL, 2009).

For example, using domestic competition factors to determine an antidumping measure application can generate inconsistencies when analyzing it by the main objective of the TTB. On the one hand, Brazilian antitrust law aims at protecting the collectivity and preserving consumers' welfare; on the other hand, antidumping measures aim to protect domestic industry from international price discrimination (MARQUES, 2013). So, since trade defense measures do not necessarily objective the protection of consumers' welfare in the short-run[21], antidumping measures can be foreclosed by divergences with government's competition policy (MARQUES, 2013).

Yet, WTO normative do not establish mechanisms to capture consumers' interest regarding antidumping investigations (AGGARWAL, 2004). And making public consultations regarding these themes is not a usual practice, since consumers has lower capability on organizing themselves to pressure government into revising their policy-making process. This underrepresentation of public interest leads to a scenario where consumers tend to get marginalized from TTB's applying set (AGGARWAL, 2004).

In Brazil, this concern is aggravated by the fact that the authority that decides about what concerns "public interest" in antidumping cases is not DECOM, the one that makes the investigation about dumping, domestic injury and the causality between them (CORDOVIL, 2009). CAMEX, the one that analyzes the factors about public interest, is a less technical and more political institution than DECOM, being more subject to bias when deciding (CASTELAN, 2012). This goes according to Aggarwal (2004, pp. 1047-1054), that considers that antidumping is "a unique combination of political and economic manipulability and ensures almost guaranteed protection to domestic producers, [...] being an easy to manipulate protectionist measure".

Those injury estimation and public interest loopholes on Brazil's antidumping legislation allow the possibility of an administrative discretion, by the Brazilian policy-maker, in an effort to postulate or foreclose investigations and the adoption and revisions of antidumping measures in specific markets of national interest.

So this is the context in which this study attempt to investigate if the economic scenario, both domestic and from Brazil's trade partners, instead of technical variables, can have been influencing the initiation, by the local government, of antidumping investigations an revisions of measures already in course.

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[21] Since "the initiation of investigations itself results in an import drop", it can, on the short-run, restrain internal supply of the imported product by increasing its prices (AGGARWAL, 2004, p. 1047).

3 EMPIRICAL FRAMEWORK

Since the end of the 21st century, researchers have been studying antidumping policies determinants and application-process in order to understand the increase of TTB measures applications. Knetter and Prusa (2000) proposed one of the first studies regarding this process, when count data models, such as negative binomial regressions, were firstly used to evaluate macroeconomic conditions over antidumping policies application. After that, several studies applied the same or similar methods when estimating the responsiveness of trade policy to macroeconomic changes, such as Aggarwal (2004), and Bown and Crowley (2013; 2014). Recent studies regarding Brazil's economic conditions and trade barriers used binary probabilistic models, such as logit/probit, to estimate its results, as Olarreaga and Vaillant (2011), Oliveira (2014), and Pinto and Carraro (2016). Mainly, the specification of the dependent variables is the main difference between these studies from those that used count data.

Specification of the dependent variables is the main factor that defines if binary probabilistic or count data models should be used to study responsiveness of trade barriers investigations and revisions on macroeconomic conditions. As will be explained on the methodology section of this study, according to our dependent variables specifications, estimations on this study are based on count data models.

The theoretical model proposed by Knetter and Prusa (2000) aimed to investigate how the number of antidumping initiations opened by Australia, Canada, the EU and the USA were being affected by real exchange rates, domestic Gross Domestic Product (GDP) and rest of the world GDP. Their results indicated a positive relation of real currency appreciation and of falls in real GDP growth on the filing country's antidumping initiations.

Therefore, they based their specification both on domestic (filling country) and foreign (affected country) conditions. In relation to this, they found that results regarding antidumping measures conditions tend to be stronger when examining bilateral conditions between trade partners (KNETTER & PRUSA, 2000). However, studies regarding TTB measures factors vary among the scope of explanatory data: domestic, foreign or bilateral. Aggarwal (2004), Oliveira (2014) and Pinto and Carraro (2016), for example, based their estimations mostly on domestic factors, while the others cited in this topic also used foreign and bilateral conditions on their analyzes.

Considering the heterogeneous aspect of antidumping determinants' framework, a brief summary of only the main studies used for this study is developed below.

Aggarwal (2004) examined the existence and how macroeconomic factors yearly affected the number of antidumping investigations in ninety-nine countries from year 1980 to 2000, including Brazil. Her model's dependent variable was the number of antidumping initiations per country analyzed (AGGARWAL, 2004). She estimated if those initiations were influenced by domestic variable changes regarding industrial value growth, trade balance and imports, tariff rates, and the number of antidumping measures sanctioned against the countries studied. This variable regarding antidumping investigations against each country was included on her study as an attempt to identify a retaliation movement from countries that may had been sanctioned with this TTB measure by its trade partners (AGGARWAL, 2004).

Aggarwal's (2004) model structure allows us to identify correlations between domestic data regarding foreign trade and industrial macro-level over antidumping initiations, verifying if there are indications of influences by domestic producers on trade authorities decisions. Using a panel set for count data and a negative binomial model estimation, she also made a comparative framework between developed and developing countries, studying possible differences between those groups of countries on antidumping initiations. Results obtained by her indicate that antidumping measures determinants on developing countries are more political than economical, being related to "trade pressures, tariff rate reductions and creating retaliatory capabilities seem to motivate the use of antidumping" (AGGARWAL, 2004, p. 1053).

Bown & Crowley (2013) studied the influence of macroeconomic factors changes on import protection policies, including antidumping investigations, from 1988 to the first quarter of 2010, of Australia, Canada, the EU, South Korea, and the USA. Their model was structured to analyze the relation between trade barriers and (i) domestic unemployment rate; (ii) bilateral real exchange rate; (iii) real GDP growth rate; and (iv) trading partner's economic growth. Their dependent variable was defined as "the count of HS-06 imported products on which the government of economy *j* conducts a *new* temporary trade barrier investigation against trading partner *i* in quarter *t* and against which there is not already an existing TTB in place" (BOWN & CROWLEY, 2013, p. 54, emphasis in original). They also used a panel set for count data analyses and a negative binomial model estimation, methods that will be further discussed on the next section of this work.

Their main results show that the initiation of new TTB investigations has a countercyclical relation with domestic macroeconomic shocks (BOWN & CROWLEY, 2013). They found that developed countries tend to apply more trade barriers against partners that are facing a period of economic contraction or of weak economic growth (BOWN &

CROWLEY, 2013). Also, they found evidence that implies behavioral changes during the last decade's financial crisis, when countries "shifted new imports protection away from those trading partners that were contracting and toward those experiencing relatively stronger economic growth." (BOWN & CROWLEY, 2013, p. 62).

Olarreaga and Vaillant (2011) analyzed Brazilian TTB measures between 1980-2010, using a panel data within probabilistic models; linear, logit and probit estimations. They investigated the relation between TTB measures applied by Brazil with variables concerning domestic activity, MFN Tariff weighted by the level of income of Brazil's trade partners, and indicators for sectorial political strength of each country affected by the TTB policy (OLARREAGA & VAILLANT, 2011). Their results indicated (i) absence of robustness on the relation between low import prices and antidumping measures applied by the country's authorities; (ii) a positive relation between imports growth, domestic currency and TTB measures in Brazil; and (iii) partial substitutability of TTBs and imports tariff both imposed by Brazil's government (OLARREAGA & VAILLANT, 2011).

Bown and Crowley (2014) estimated the impact of macroeconomic fluctuations and WTO commitments on trade policies of eleven emerging countries, including Brazil, between 1989 and 2010. They verified if the number of products initiated under TTB measures could be explained by changes on bilateral real exchange rate; domestic and foreign GDP; import Tariff rates; and imports growth. They found (i) a countercyclical relation between macroeconomic conditions and TTB measures applications, which was intensified after the GATT 1994; (ii) a substitutability relation between TTB applications and import tariff; and also (iii) indications of influence between real exchange rates shocks and trade defense policies (BOWN & CROWLEY, 2014). Their analysis consists on a panel data model, estimated by a Negative Binomial process (BOWN & CROWLEY, 2014).

Oliveira (2014) verified if there are sectorial-level characteristics that increases or reduces domestic industry chances on receiving protection of antidumping measures in Brazil, considering data from 1996 to 2007. By a panel data set with a binary response model analysis, his results show negative relation between TTB measures and tariff and productivity rates and labor availability (OLIVEIRA, 2014). On the other hand, imports volume, investment level and natural resources intensity have shown positive influence to antidumping rights applications (OLIVEIRA, 2014). Additionally, he found evidences of possible positive relation between market power and applied measures.

Pinto and Carraro (2016) estimated the relation between antidumping measures imposed by Brazilian government and macroeconomic factors, from 2000 to 2011, using *logit*

and *probit* models. Exchange and unemployment rates, GDP growth and dummies for specific trade partners and for election years were used as explanatory variables on the study (PINTO & CARRARO, 2016). However, their main results do not show robustness to the analysis, indicating that domestic industry concerns may be subdued by trade partners' (PINTO & CARRARO, 2016).

Firme et al (2018) verified the influence of national and foreign GDP, balance of payments, and real exchange and inflation rate on the AD cases opened by Brazil and Argentina. Their estimation was based on an autoregressive distributed lag model, using an adapted Poisson model to test larger amounts of selected disaggregated variables. They found that the number of antidumping cases opened by Brazil and Argentina are related to changes on the macroeconomic conditions that they modeled, with a higher-sensibility of this relation when those variables were disaggregated. Specifically for Brazil, they also found (i) a negative relation between the current AD cases and the filings opened in the past, the foreign GDP and the exchange rates devaluations; (ii) a positive relation between the number of AD openings and the balance of payments and domestic GDP results; and (iii) possible null effects of inflation rate changes and the number of cases initiated.

Matters concerning models and results used in these studies are posteriorly approached in the next chapter.

4 METHODOLOGY

This chapter is divided into three sections: (i) data, that shows variables specification and summary statistics; (ii) modeling, which includes our empirical and count data models specifications; and (iii) expected results, mainly based on the empirical framework.

4.1 DATA

Data under antidumping was compiled from DECOM reports regarding TTB measures applied and investigations opened by the Brazilian government since the 1980's (MDIC, 2018b). The explanatory variables' databases were built from information available by the World Bank's (WB) in World Development Indicators (WDI) and World Integrated Trade Solution (WITS) databases, and the Brazil's Ministry of Industry, Foreign Trade and Services in "Comex Stat" database (MDIC, 2018b, 2018e; WB, 2018a, 2018b). Table 2 below details variables' descriptions and sources.

TABLE 2 – DESCRIPTION OF THE VARIABLES

Variable name	Variable code	Lag	Description	Source
Antidumping	AD_{pt}	0	Dependent variables – Number of antidumping investigations and revisions opened against trade partner *p* in year *t*.	MDIC, 2018b
Industrial value	$IVAGR_{pt-1}$	-1	Difference in Brazil's and foreign' partner *p* growth rates (%) of Industrial value added in year *t - 1*.	WB, 2018a
Trade balance	$TRBAL_{pt-1}$	-1	Trade balance FOB USD value (difference in exports and imports) as a ratio of total trade[22] FOB USD value between Brazil and partner *p* in year *t - 1*.	MDIC, 2018e
Imports growth	$IMGRTH_{pt-1}$	-1	Growth rate (%) of imports FOB USD value from partner *p* to Brazil in year *t - 1*.	MDIC, 2018e
Imports share	$IMSHR_{pt-1}$	-1	Ratio (%) between imports FOB USD value from partner *p* and all Brazilian imports FOB USD value in year *t - 1*.	MDIC, 2018e
Tariff	$TARIFF_{pt-1}$	-1	Average weighted tariff rate (%) imposed against partner *p* by Brazilian authorities in year *t - 1*.	WB, 2018b
Measures against BR	AFF_{pt}	0	Number of antidumping investigations and revisions opened by trade partner p against Brazil in year t ("retaliation trial").	MDIC, 2018b

SOURCE: elaborated by the author.

This study's countries-scope is delimited by all nations that filled antidumping investigations against Brazil or that where investigated by Brazilian authorities between 1995 and 2017. These countries are listed on Table 8, available at Appendix 1.

[22] Total trade is defined as the sum of exports and imports.

Tariff data concerning "Europe and Central Asia" and "Other Asia, not elsewhere specified" where used as proxies for, respectively, the EU[23] and the Chinese Taipei (Taiwan) (UN, 2018)[24]. Also, for unavailability reasons, data for added industrial value concerning Taiwan was substituted by those regarding "East Asia and Pacific".

As said previously, besides analyzing Brazil's behavior regarding antidumping investigations and revisions, we also made a complementary discussion concerning the country's behavior relative to developed and developing partners separately. In order to do so, we constructed three databases for this study: (i) the first, identified as "all countries", regards all countries that filled antidumping investigations against Brazil or that where investigated by Brazilian authorities between 1995 and 2017; (ii) the second, "developed", concerns only developed countries from the first database; and (iii) the last, "developing", only features data of emerging countries from the "all countries" database. Categorization of countries between developed and developing followed the International Monetary Fund's (IMF) World Economic Outlook Database arrangement (IMF, 2016).

All databases are structured as panel-data sets for countries and year. Ideally, quarterly data would be the best frequency analysis to this study, since it allows to better address the sensitiveness between antidumping measures and changes on growth and import rates (BOWN & CROWLEY, 2013). However, due to quarterly disaggregated data unavailability for two explanatory variables, industrial value and tariff, this investigation is based on an annual periodicity. Tables 3, 4 and 5 below provides summary statistics concerning variables on the three databases made for this study.

TABLE 3 – SUMMARY STATISTICS: ALL COUNTRIES DATABASE

	All countries				
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Antidumping	1472	0.382	1.335	0	25
Industrial value	1399	-0.060	0.086	-0.436	0.177
Trade balance	1459	0.187	0.433	-0.932	1
Imports growth	1460	0.325	1.715	-1	29.166
Imports share	1469	0.017	0.040	0	0.310
Tariff	1417	0.100	0.056	0	0.337
Measures against BR	1472	0.054	0.343	0	5

SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

[23] For simplification purposes and since there are antidumping measures applied by Brazilian authorities against European countries and the European Union separately, this trade bloc was considered as a separated country for this study.

[24] Considering Taiwan as "Other Asia, not elsewhere specified" is recommended by the United Nations' International Trade Statistics administration (UN, 2018).

TABLE 4 – SUMMARY STATISTICS: DEVELOPED COUNTRIES DATABASE

Developed					
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Antidumping	667	0.324	0.809	0	8
Industrial value	634	-0.018	0.054	-0.169	0.164
Trade balance	664	0.050	0.406	-0.902	0.962
Imports growth	662	0.245	1.572	-0.902	29.166
Imports share	664	0.026	0.052	0.000	0.310
Tariff	657	0.111	0.038	0.010	0.233
Measures against BR	667	0.063	0.390	0	5

SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

TABLE 5 – SUMMARY STATISTICS: DEVELOPING COUNTRIES DATABASE

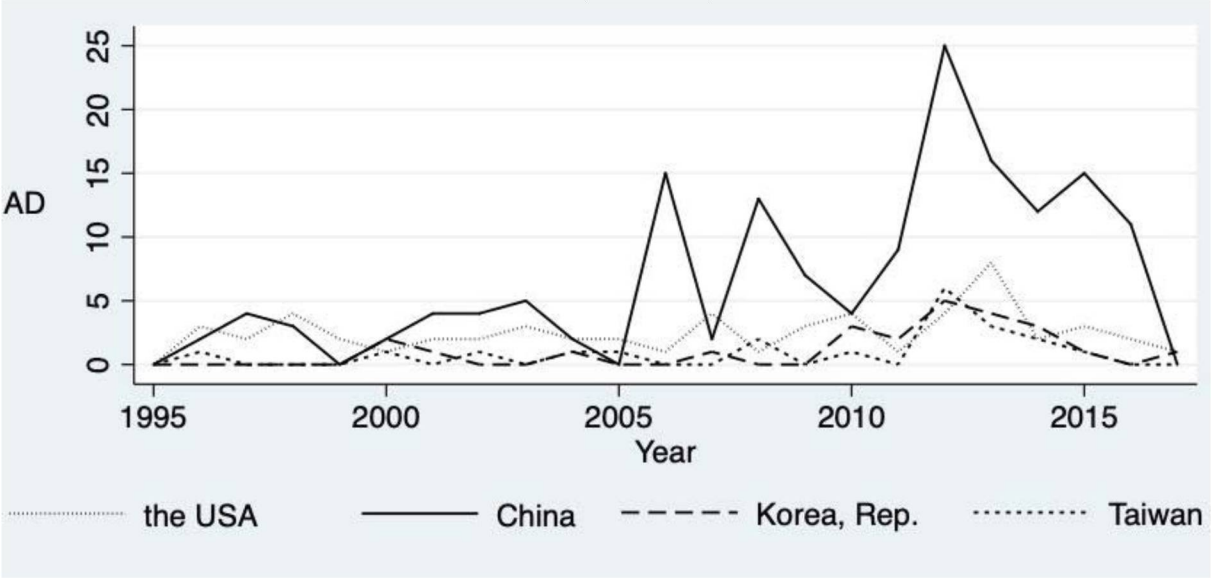
Developing					
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Antidumping	805	0.431	1.647	0	25
Industrial value	765	-0.095	0.092	-0.436	0.177
Trade balance	795	0.302	0.423	-0.932	1
Imports growth	798	0.392	1.823	-1	27.838
Imports share	805	0.009	0.023	0	0.179
Tariff	760	0.091	0.066	0	0.337
Measures against BR	805	0.047	0.299	0	5

SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

Brazil's trade partners that are historically more susceptible to suffer TTB measures by it are the USA, the EU, China, Argentina and, on less susceptibility, South Korea, Taiwan, Colombia and the Russian Federation (OLARREAGA & VAILLANT, 2011). In 2012, Brazilian authorities opened twenty-five antidumping investigations/revisions against China, this being the largest number of investigations/revisions initiated against the same trade partner in a year regarding Brazil's trade defense system. Thus, this is the maximum value assumed by our dependent variables, AD_{pt}, for both "all countries" and "developing" databases.

The discrepancy of how greater is the number of investigations/revisions opened against China since the 2000s is shown in Figure 4, which implies the only four countries that were investigated by Brazilian authorities at least five times in the same year since 1995. Even considering only these trade partners, China stands out by investigations and revisions as a high target.

FIGURE 4 – NUMBER OF ANTIDUMPING INITIATIONS OPENED AGAINST COUNTRIES THAT WERE INVESTIGATED BY BRAZILIAN AUTHORITIES AT LEAST FIVE TIMES IN ONE SINGLE YEAR (1995–2017)



SOURCE: elaborated by the author, based on MDIC (2018b).

Concerning only developed countries, the USA is Brazil's trade partner mostly investigated in a year, with a total of eight investigations/revisions opened in 2013. On average, Brazil initiates more antidumping investigations/revisions against developing than developed countries. Besides assuming this considerable high maximum numbers, the AD_{pt} variable has its means below 0.5 for all three databases. This reduced mean, compared to its maximum values, is resulted by the reasonable number of observations that assume null values for our dependent variables. Conditions regarding the right-skewed distribution of AD_{pt} are posteriorly approached, in the subsection relative to Count Data Models.

The added industrial value variable, $IVAGR_{pt-1}$, is defined as the difference between Brazil's and each trade partner *p* growth rates in year t – 1. This specification gives us a Brazil's industrial value changes in terms of the country's *p* industrial value variations. In a given year, if the trade partner's *p* industrial performance was worse (better) than Brazil's, the variable assumes positive (negative) value. So, even if Brazil's economy registered losses in its domestic added industrial value, the variable $IVAGR_{pt-1}$ still can assume positive values. However, in general, local industrial performance, in comparison with the trade partners selected for this study, shows more negative than positive values in all three databases.

$TRBAL_{pt-1}$ gives the trade balance as a ratio of total trade between Brazil and partner *p* in year t – 1. When this variable assumes values closer to 1 *[–1]*, country *p* is mostly an importer *[exporter]* of Brazil's goods and services. If $TRBAL_{pt-1}$ assumes null values, the

trade partner imports from Brazil the same Free on Board (FOB) USD value that it exports to this country.

When considering its minimum and maximum values on all databases, $TRBAL_{pt-1}$ has a wide range, assuming values from almost –1 to 1. Commonly, Brazil slightly exports more than imports from the countries selected on our sample, without significant distinctions between developed and developing trade partners.

Imports growth variable, $IMGRTH_{pt-1}$, states for the growth rate of imports from country *p* in year t – 1. This variable has a higher range and standard deviation when compared to others because of the high percentages that it assumes within some trade partners, mostly small economies such as Bahrain, Estonia and Macedonia, taking on 291.66% as its maximum value.

$IMSHR_{pt-1}$ represents imports share, defined as the ratio between imports from partner *p* and all Brazilian imports in year t – 1. It captures how much each country *p* represents on Brazil's imports agenda. Summing up $IMSHR_{pt-1}$ data per year, we found out that our sample gathers countries that represent between 90% and 95% of Brazil's yearly imports value. Regardless of the EU data, the USA registers the highest share of this agenda in our databases, accounting 23.83% of all goods and services, in value, imported by Brazil in 2000.

From the 2000s, China's share in Brazil's imports agenda has been rapidly increasing (PAUS, 2009). However, it still did not reach the USA values from the 1990s. China's highest share in Brazil's imports was registered in 2016, when goods and services from the country represented 17.91% of this agenda.

$TARIFF_{pt-1}$ gives the average weighted tariff rate imposed against country *p* by Brazilian authorities in year t – 1. The highest tariff rates registered in our sample were charged against the emerging countries of Bangladesh, Macedonia and Pakistan in the last seven years. However, considering our sample, Brazil charges, on average, higher tariffs against developed than developing countries.

This occurs because the high rates charged against those three developing countries are compensated, on average, by the low – sometimes nulls – rates charged against Southern Common Market (MERCOSUR, in its acronym in Spanish) and other Latin American nations (WB, 2018b). Thus, besides having a lower mean when compared to other databases, $TARIFF_{pt-1}$ at the "developing" one has the highest standard deviation.

AFF_{pt} stands for the number of investigations and revisions opened against Brazilian imports by trade partner *p* in year t. Argentina and the USA are the countries that most opened

investigations/revisions against Brazilian imports in a year, totaling nine cases in 2016 for both. Notwithstanding, on average, developed nations open more investigations against Brazil than developing ones. In addition, Brazil initiates more antidumping procedures than its trade partners fills against it.

Correlation matrices about the variables explained above for each database are disposed on Appendix 2. They present a necessary comparison to dispel multicollinearity concerns as for our model, specified in the next subsection.

4.2 MODELING

This subsection relates to discussions regarding our empirical model and count data models. It is divided into two parts: (i) the specification of the empirical model; and (ii) the discussion of count data models estimation.

4.2.1 Empirical Model

The dependent variables are specified not only by the counting of opened investigations, but also by the number of revisions of already applied measures. Considering that the mere opening of an antidumping investigation entails trade distortion, would be reckless not to consider investigations in this study (PRUSA, 1992; NAIDIN, 1998; AGGARWAL, 2004; BOWN & CROWLEY, 2013; BESEDES & PRUSA, 2017).

To an antidumping measure in force have its end date revised, Brazilian authorities initiate a brief investigation to verify if the dumping practice is still in force. As on the opening investigations, the foreign country is informed about revisions in relation to its domestic industry. Considering that these revisions have similar procedures and effects of an investigation, and potentially extend the temporary behavior of antidumping rights, it makes sense also to add these events to the dependent variables. So, in Brazil, a boost in AD cases opened in the past would tend to reduce the number of current initiations and increase the number of current revisions.

As a result, our response variable of interest can be classified as a non-negative integer count; it is discrete and does not necessarily behave as the classical regression model usually studied on Econometrics, as further developed on the subsection of count data models (CAMERON & TRIVEDI, 2009).

Since antidumping measures are bilateral[25] policies focused on specific markets, they are less heterogeneous than ampler measures such as export subsidies, which concerns multiple markets. Hence, the explanatory variables are also restraint by bilateral relations between Brazil, the domestic country, and its trade partners; it aims at capturing Brazil's foreign trade characteristics in function of each trading partner. This restriction was created based on the "discriminatory (i.e., trading partner-specific) nature of the import protection" (BOWN & CROWLEY, 2013, p. 52).

Thus, this allows studying with only macroeconomic fluctuations that indeed affected trade relationship between Brazil and its trade partners. In this way, our model aims at properly capturing eventual bilateral shocks between our domestic country and its exporters' countries. This bilateral emphasis reinforces studying one country in specific, in this case, Brazil.

Thereby, it is expected a reduction on noises from possible heterogeneities based on non-observed variables, that could influence each trade relation from Brazil with its partners. Still, studying bilateral relations also helps to disregard countries' cultural, ethnic or geographic aspects that could influence the magnitude of trade change over time.

Based on that, on the description of the variables in Table 2 and on Aggarwal's (2003, 2004) model, this study's model is specified as a panel data set defined by the equation (4) below:

$$AD_{pt} = f(IVAGR_{pt-1}, TRBAL_{pt-1}, IMGRTH_{pt-1}, IMSHR_{pt-1}, TARIFF_{pt-1}, AFF_{pt}) \quad (4)$$

Regressors' lag structure is due to the usual dumping investigation procedures made in Brazil (KNETTER & PRUSA, 2000; AGGARWAL, 2004; BOWN & CROWLEY, 2013). As said before, Brazil bases its investigations on prices of at least six months before the initiation and, preferentially, of the year preceding the antidumping application (MDIC, 2018a; WTO, 2018a). So, in order to obtain methodological consistency and robustness, this study also uses one year-lagged variables about the antidumping investigation (HAMILTON, 1994).

The empirical framework typically reports results with a three-year lag on variables involving economic growth, such as GDP or added industrial value, for determinants pertaining to antidumping rights applied (KNETTER & PRUSA, 2000). This higher lag is justified on the argument that countries usually consider a longer time horizon, over three

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[25] As defined by Bown & Crowley (2013, p. 52): "bilateral measures of import protection – i.e., between a policy-imposing economy and a particular trading partner"

years preceding the initiation, to evaluate an injury on the domestic industry (KNETTER & PRUSA, 2000).

In Brazil, DECOM considers the last sixty months (five years) before the initiation filing to investigate an injury, being the most recent year the same as of dumping prices considered in the same investigation (MDIC, 2018f). This extended period is necessary in order to identify properly if the injury during the year of dumping was in fact caused by the price discrimination or by other variables that were affecting industrial performance in a longer term (MDIC, 2018f). For Brazil, identifying an injury concomitantly with the practice of dumping in the year before the investigation is a necessary but not sufficient condition to apply an antidumping right: another prerequisite is to prove that at least part of this injury was caused by the price discrimination.

Therefore, considering antidumping measures effectively applied, we can only be sure about a slowing-down/worsening performance of the dumped industry in the year that preceded the investigation filling. The other four years from the sixty months can even show improving results for the domestic industry, which may be harmed only a year before the filing. With this, and as proposed by Aggarwal (2004), we sustain a one-year lag for our trade balance-related and industrial value-added variable.

The only exception in this lag-specification is the absence of lag for the "Measures against Brazil" explanatory variable, AFF_{pt}. Since it aims at capturing a possible retaliation movement on foreign trade, this behavior should occur in shorter-terms and disregards market conditions to occur. Consequently, it must have a briefer lag when compared to other variables.

Considering that this study is based on an annual frequency for all data, concerns as for proper lag is less-sensitive than if it would consider quarterly data. As previously said, since the latter is not feasible for our model specification, using annual data, despite being a viable approach, reduces eventual preoccupations about our lag-specification by being a more time-aggregated approach. Also, as further explained, the chose frequency reduces right-skewed concerns from our dependent variables distributions.

4.2.2 Count Data Models

As previously said, our dependent variables are non-negative integer counts; they are discrete and do not necessarily behave like the classical regression model usually studied on Econometrics (CAMERON & TRIVEDI, 2009). They have mostly few small discrete values,

as described in Appendix 3, and their distributions are commonly skewed to the right. Generally, the most used models for these count data analysis are the Poisson Regression Models (Poisson) and Negative Binomial Models (NB).

Poisson and NB are also mostly used on empirical specifications around aspects of antidumping investigations/rights (AGGARWAL, 2004; BOWN & CROWLEY, 2013, 2014); those non-linear models tend to properly specify panel-data sets for non-negative integer count dependent variables. According to Aggarwal (2004, p. 1049) and Cameron and Trivedi (2009, pp. 802-808), Poisson's distribution (5) and regression function (8) takes:

$$\text{Prob}\ (Y = y_{it}) = \exp(-\lambda_{it})\lambda_{it}^{yit})/y_{it}!,\ y_{it} = 1, 2, 3, \ldots, \tag{5}$$

where:

$$E_P(y_{it}) = \lambda_{it};\ \text{and} \tag{6}$$

$$V_P(y_{it}) = \lambda_{it};\ \text{and} \tag{7}$$

$$\log \lambda = X\beta. \tag{8}$$

When the dependent variable's dispersion does not significantly equal its mean, conditions of Poisson's maximum likelihood estimator efficiency and consistency are not fulfilled (CAMERON & TRIVEDI, 2009). Usually, considering the right skew of the dependent variable's distribution, empirical estimations on antidumping find over-dispersion – $V(y_{it}) > E(y_{it})$ – when λ_{it}'s mean and variance are compared. Regarding that our proposed dependent variables are predominantly molded by null values, as shown in Appendix 3, this amount of zeros can invalidate Poisson's models' estimations, the most used on cases similar to the current (AGGARWAL, 2004).

This requires alternatives, as a NB model application, in order to correctly fit this condition (HAUSMAN et al, 1984; AGGARWAL, 2004 BOWN AND CROWLEY, 2013). NB is a generalization of Poisson's model that considers an individual and unobserved effect into the conditional mean μ_{it}, taking the regression model (10) (AGGARWAL, 2004):

$$\log \mu_{it} = \log \lambda_{it} + \log \mu_{it};\ \text{and} \tag{9}$$

$$\log \mu_{it} = x_{it}\beta + e_{it}, \tag{10}$$

where e_{it} defines the specification error or a cross-sectional heterogeneity, with $\exp(e_{it}) \sim \Gamma$ (x_{it}, μ_{it}); and

$$f(y_{it} \mid x_{it}, \mu_{it}) = ((\exp(-\lambda_{it}\,\mu_{it}))(\lambda_{it}\,\mu_{it})^{yit})/y_{it}! \tag{11}$$

where: $f(y_{it} \mid x_{it}, \mu_{it}) \sim \text{Pois}\ (\mu_{it})$;

$$E_{NB}(y_{it}) = \lambda_{it};\ \text{and} \tag{12}$$

$$V_{NB}(y_{it}) = (\lambda_{it} + 1/\theta). \tag{13}$$

Over-dispersion is statistically present in the estimator's distribution when $1/\theta > 0$; while if $1/\theta \rightarrow 0$, NB distribution converges to Poisson's (CAMERON & TRIVEDI, 2009).

In order to address concerns about the right-skewed behavior of our dependent variables, Zero Inflated (ZI) models could also be used instead of Negative Binomial. However, the specific case of antidumping determinants studies hardly allows this adjustment, since it would be necessary to distinguish the dependent variables' null values between sampling zeros and structural zeros [26] (AGGARWAL, 2004). Applying this distinction on the current case requires assuming that Brazilian authorities could not apply antidumping measures against some specific countries, which goes against our dependent variables specification (AGGARWAL, 2004).

Given that there are no available ways of doing this distinction in the present case, ZI models were not used in this study's estimations. If we used quarterly-frequency data for our model, this number of null values from our dependent variables would be inflated, which could make this study unfeasible.

Instead, for robustness check, we compare results obtained by Poisson and NB Models with a censored model estimation. Censoring occurs when, despite having full information as for explanatory variables, only a restricted sequence of the dependent variable is available (CAMERON & TRIVEDI, 2013). For the censored model, we assumed a loss of information of the null values of our dependent variables. Since the supposed lost information is on the left side of our variable's distribution, in relation to our sequence of $AD_{pt} = 0$, we face a left-censored data issue.

Tobit is a common censored model. Besides being a more available method and assuming a non-linear function between the censored and uncensored sequences, its maximum likelihood estimator is similar to censored count models (CAMERON & TRIVEDI, 2013). Consequently, we estimate Tobit results in order to compare their direction and significance outcomes with those obtained by Poisson and NB processes. In comparison, since Tobit censors null values from the dependent variables, it is expected higher magnitude from its results when compared to those of Poisson and NB.

Confirmation on the best-fit model for this case, therefore, will be obtained after comparing, in the next chapter, results and post-estimation robustness tests.

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[26] Sampling zeros and structural zeros are references to unobserved sequences designated as null values on sample. The distinction between them is that the first one refers to the limited size of the sample, while the second on refers to data being grammatically forbidden or otherwise illicit. (MOHRI AND ROARK, 2005).

4.3 EXPECTED RESULTS

This subsection explores the expected results having to do with the awaited magnitude and direction of our model variables. It is divided into three parts: (i) main macroeconomic conditions, which covers likely results for the industrial value variable; (ii) foreign trade conditions, that includes expected results for trade balance, imports growth, imports share, and tariff variables; and (iii) "Retaliation" trial, which considers matters regarding the AFF_{pt-1}, or "Measures against BR", variable.

4.3.1 Main Macroeconomic Conditions

The industrial value variable, $IVAGR_{pt-1}$, is a *proxy* for economic productivity proposed by Aggarwal (2004) for studies of antidumping determinants.

Considering that most of the non-industrial commodities have their prices internationally given in foreign trade, it is arduous to practice price discrimination in such condition. Because of this, products involved in TTB investigations are generally manufactured (PIANNI, 1998; VASCONCELOS & FIRME, 2011; CASTELAN, 2012; OLIVEIRA, 2014). Hence, using this variable for antidumping matters is suitable as a *proxy* for a product rate under competitiveness changes (OLIVEIRA, 2014).

Increases on TTB measures initiations are expected during periods of domestic recession; by the theoretical framework, weak domestic macroeconomic conditions should promote an increase on this policy's applications (LEIDY, 1997; AGGARWAL, 2004; BOWN & CROWLEY, 2013). This is based on four main factors: (i) government attempts to reducing import competition effects on the domestic industry, assuming the TTB as a protectionist policy; (ii) responses of eventual lobby pressures from domestic producers; (iii) increases on the probability of finding out material damage, since there are unfavorable macroeconomic conditions caused by the recession; and (iv) a political tendency on attributing the crisis to external factors. (AGGARWAL, 2004; BOWN & CROWLEY, 2013). Also, when economies are facing weak macroeconomic conditions, "returns from investing resources in seeking protection are seen to be higher than in investing in production activities" (AGGARWAL, 2004, p. 1053).

However, Olarreaga and Vaillant (2011) and Firme et al (2018) found distinct results linked to domestic production on their empirical study: a positive correlation between local GDP, or Gross National Product (GNP) *per capita* and TTBs imposed by the Brazilian

government. This may suggest that antidumping measures in Brazil are most used in the presence of domestic economic growth.

Nonetheless, their comparison between local economic activity and the TTB applied disregarded foreign conditions that may have affected Brazil's decision on adopting this barrier. In that time, if other countries were in better economic conditions than Brazil, registering higher growth rates than the domestic one, this identified increase on Temporary Trade Barriers applied by Brazilian authorities may have been caused by an attempt of reducing foreign competition to protect the domestic industry.

Referring to relation between foreign activity and domestic AD initiations, Bown and Crowley (2014), Pinto and Carraro (2016) and Firme et al (2018) found evidence of a positive relation between the adoption of antidumping measures by Brazil and higher rates of economic growth by its trade partners, which corroborates with an expected negative direction on $IVAGR_{pt-1}$ results.

Therefore, our economic productivity *proxy* is specified in a way to capture this domestic conditions combined with the foreign'. As previously explained, $IVAGR_{pt-1}$ considers Brazil's industrial value-added in year t – 1 in terms of the trade partner *p*'s industrial value-added registered in the same year. So, based on the theoretical literature and on our variable specification, we expect a negative relation between $IVAGR_{pt-1}$ and the number of investigations/revisions opened by the Brazilian authorities.

4.3.2 Foreign Trade Conditions

For variables concerning international trade such as trade balance, imports growth, imports share, and tariff rate, there is conformity between the theoretical and the empirical literature. We expect rises on the number of antidumping filings with higher volumes of imports, and trade balance negativity (AGGARWAL, 2004). Furthermore, countries that face negative pressures on their Balance of Payments may be more investigated than those without it (FIRME et al, 2018). According to Bown & Crowley (2013, p. 53), this happens when "a national authority's antidumping investigation places more weight on the criterion of injury to the domestic industry than it places on the criterion of dumping".

Economies that are undergoing a process of trade opening by tariff reduction may register a concomitant increase on temporary barriers applications. This conflicting action is based on the necessity of protecting strategic industries, or even as a reaction to pressures by political groups (AGGARWAL, 2004). Considering that lowering tariff rates tend to increase

imports volume, expecting an inverse relationship between these rates and antidumping initiations is coherent with what was provisioned on the last paragraph. Empirically, Olarreaga and Vaillant (2011) found this substitutive relation between TTB and tariff rates for Brazil in a sectorial-level. This result reinforces expectations on finding the same relation with the proposed bilateral analysis.

Therefore, we expect a negative relationship of both the tariff rate and the trade balance on antidumping initiations, while we may found a positive relation between our dependent variables and imports growth and share (AGGARWAL, 2004; OLARREAGA & VAILLANT, 2011; BOWN & CROWLEY, 2013, 2014).

4.3.3 "Retaliation" Trial

Empirical studies on antidumping investigations initiated as a possible retaliation against trade partners that had first opened TTB measures are scarcer. Prusa and Skeath (2002) found evidence that the rise in antidumping measures are not necessarily correlated by increases in unfair trading, but with a strategy to punish trade partners that have applied rights before. Blonigen and Bown (2003) found sensitiveness between retaliation threats and antidumping initiations in the USA from 1980 through 1998, with potential effects on local and USA's trade partners' domestic industries. Aggarwal (2004) found a robust and great magnitude influence on this variable for developing countries in general.

Thus, we propose in this study to verify if the same can be said about the Brazilian case specifically. As previously said, DECOM, the Brazilian authorities that leads antidumping investigations, also follows cases opened against its country. Thus, there is no Chinese Wall[27] between the government unit responsible for monitoring investigations filed against Brazil and the one that files those against Brazil's trade partners. This reinforces the need to verify if Brazil's tends to investigate, with a higher frequency, those trade partners that historically opened antidumping investigations against the country.

Based on this discussion, we expect to find a positive sensitivity from AFF_{pt} and filled investigations/revisions. Table 6 sums up the explanatory variables expected signals' results, considering the theoretical hypothesis developed in this subsection.

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[27] Chinese Wall is a set of "[...] restrictions that prevent the flow of confidential information between one division of an institution and another, or between institutions" (McLEOD, 1986, p. 489).

TABLE 6 – EXPECTED RESULTS OF THE EXPLANATORY VARIABLES

Variable name	**Variable code**	**Expected result (signal)**
Industrial value	$IVAGR_{pt-1}$	–
Trade balance	$TRBAL_{pt-1}$	–
Imports growth	$IMGRTH_{pt-1}$	+
Imports share	$IMSHR_{pt-1}$	+
Tariff	$TARIFF_{pt-1}$	–
Measures against BR	AFF_{pt}	+

SOURCE: elaborated by the author.

5 RESULTS AND DISCUSSION

This chapter is divided in two sections. First, robustness regarding estimations made is analyzed by the results from Hausman and Wald Chi-squared tests. Thereafter, results are properly interpreted and discussed.

5.1 ROBUSTNESS ANALYSIS

Table 7 shows the results regarding each database of this study, for the maximum-likelihood estimations for Fixed Effects Poisson [FE Poisson], Random Effects Poisson [RE Poisson], Random Effects Tobit [Tobit], and Fixed Effects Negative Binomial [NB].

Due to data unavailability of industrial value added for North Korea and of tariff rates for Yugoslavia, these countries were dropped from all estimations. Because of the sample period and unavailability of some explanatory variables for Bosnia and Herzegovina, Costa Rica, Croatia, Slovenia and Macedonia, only $AD_{pt} = 0$ observations were considered for them in the regressions. Giving this time-steady characteristic of the dependent variables for these countries, the fixed effects truncated them as they were considered never having reported antidumping cases. So, they were dropped from the FE Poisson and NB estimations.

First, we estimated Fixed (FE) and Random Effects (RE) Poisson models for "all countries". Given our model specification and results obtained from Hausman Specification test[28], at 1% significance level, we chose on working with FE for the Poisson and the Negative Binomial estimations.

However, it was not possible to estimate Hausman results for "developed" and "developing" estimations because models regarding these databases did not meet the asymptotic assumptions of the test. Since this misspecification commonly happens with small samples, the smaller number of observations for those two databases, when compared to the "all countries" one, is a probable cause for the test results (SCHREIBER, 2008).

Thus, comparing the Wald Chi-squared test[29] results may be useful to obtain the best-fit model for our estimations. (CAMERON & TRIVEDI, 2009). For all countries and

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[28] Hausman Specification test "is used to test for orthogonality of the common effects and the regressors, [...] being an useful device for determining the preferred specification of common effects model". (GREENE, 2012, pp. 419-420).

[29] Wald Chi-squared test is the most used procedure "to fit the regression without restrictions, and then assess whether the results appear, within sampling variability", to check if there are coefficients bias (GREENE, 2012, p. 155, emphasis added).

developing databases, the Wald test registered a significance of 1% both for FE Poisson and NB estimations, being indifferent for with the choosing of the best-fit estimation. For the developed countries database, at a 5% of significance level, the Wald test indicates that FE Poisson results on a best fit with the proposed model when compared to NB's.

Given that, and assuming the existence of a bilateral relationship-specific heterogeneities in antidumping the decision-process by the Brazilian authorities for each trade partner, it makes sense to use fixed effects estimation in order to control time-invariant effects (BOWN & CROWLEY, 2013). Thus, we chose to report estimates both on Fixed Effects Poisson and NB results for discussions regarding the analysis results.

Regarding Tobit estimations, its estimator for FE is biased and inconsistent, since it is a censored-data regression that assumes a non-linear function (GREENE, 2007). Consequently, this led us to estimate Tobit for this study. The likelihood-ratio tests for Tobit's panel-level variances indicate that the RE estimators are statistically different from the pooled Tobit estimators, at a 1% of significance level. This result reinforces the Random Effects specification of our estimations for this model.

For the "all countries" estimation, 1059 observations from a total of 1344 were considered left-censored in Tobit results. For "developed" and "developing" databases, 490 and 569 observations were, respectively, were left-censored. Considering the number of observations that were dropped for methodological reasons, the count of left-censored observations given by Tobit results table coincide with the null values of our dependent variables.

Table 7 gives us our estimations and post-estimation tests results. Coefficients of Poisson and NB models are in terms of logs of expected count. Otherwise, Tobit coefficients are in terms of marginal effects for the uncensored observations.

In addition to Table 7, Poisson and NB models results can also be reported as Incidence-Rate Ratios (IRR) for the explanatory variables. These rates are an usual and preferable alternative to interpret the coefficients found since they allow an easier interpretation: values for IRR that are statistically greater (smaller) than 1 indicate a positive (negative) sensitiveness between the dependent and the explanatory variable which it refers.

Still, Tobit results can also be reported as marginal effects of a specified prediction. The predictive marginal effects give us results in terms of condition expected value of variables or individuals of interest. In this case, we estimated the marginal effects on the conditional expected value of the censored prediction at means of covariates; so, we predicted, considering the observed variables, the expected probabilities of a supposed trade

partner with average characteristics, defined by the means of our explanatory variables, being investigated by Brazil's trade authority.

Results in terms of IRR, for Poisson and Negative Binomial, and of predictive marginal effects, for Tobit, are discussed in the next paragraphs and shown in Appendix 4.

5.2 RESULTS DISCUSSION AND COMPARATIVE ANALYSIS

Our findings for industrial value added were statistically significant, but weak, for the "all countries" and "developing" databases. The FE Poisson IRR for all countries, on average, gives that a 1% decrease in $IVAGR_{pt-1}$ leads to a increase of 0.998% in counts of investigations/revisions filled by Brazilian authorities. Results specific for the developing database were slightly higher but, however, not sufficient to imply a greater susceptibility of injury to the domestic industry by imports originated from emerging countries.

Regardless of its magnitude, this result is in accordance with Aggarwal (2004), Bown and Crowley (2014), Pinto and Carraro (2016) and Firme et al (2018). This means that Brazil tends to fill more antidumping initiations against trade partners with higher industrial value added rates than local's; indicating a expected tendency towards protectionism when Brazil's economy shows worse growth rates in terms of its trade partners'. So, if other countries register higher growth rates than the Brazil's, Brazilian authorities tend to reduce foreign competition to protect the domestic industry by applying TTB measures.

Turning to trade balance results, they also indicate a negative relation with our dependent variables. For FE Poisson IRR regarding developing countries, it is expected a decrease of 65.9% on the number of investigations/revisions filled by 1 unit increase $TRBAL_{pt-1}$. While for developed countries this percentage rises to 71.6%.

This means, as expected, that Brazil fills less antidumping investigations/revision against partners that exports more than imports to the Latin American country. This imply an indirect negative relation between Brazil's trade-dependency and TTB measures policies; which means that partners that imports from more than exports to Brazil are less susceptible on being investigated by it. This is in accordance with the theory that countries that face negative pressures on their Balance of Payments can be more investigated than those without it.

Considering that exporting is an obligatory requirement to allow being investigated for an international price discrimination, this result is expected: a country that practices dumping must exports. However, this result can also imply that, in order to maintain its

economy running, Brazil avoids trade disputes with partners that predominantly import its products. In this case, partners that export to Brazil without the counterpart of also importing from this country are more susceptible to face investigations than those that sustain, at least, equilibrium of the bilateral trade balance.

This behavior is more frequent with developed than with developing countries, which is expected since Brazil has, on average, a more positive trade balance with developing countries. However, this also imply that, all else unchanged, a trade partner that predominantly exports to Brazil faces more antidumping investigations/revisions if it is classified as a developed country. Also, if this same partner reverses the bilateral trade balance with Brazil and begins to predominantly imports from the Latin American country, it faces less initiations just by being developed.

While the variable regarding imports growth did not show significant results, $IMSHR_{pt-1}$ registered high-magnitude and significant results in terms of IRR. In order to facilitate interpretation, we will base interpretations of this variable on Tobit's predicted marginal effects, that were highly significant and, on average, similar to those in IRR. For all countries, all else unchanged, the addition of approximately 1% on the share of trade partner's *p* on Brazil's imports agenda is expected to generate an increase of almost 6 counts of investigations/revisions by.

This result was expected, since Oliveira (2014) found a positive relation between antidumping measures and imports volume in Brazil. But it also reinforces discussions on $TRBAL_{pt-1}$: the more a trade partner exports to Brazil, the greater the chance of being investigated on the practice of dumping. Considering this result, does a higher shareholder on Brazil's imports agenda has more incentives to practice dumping, and therefore, is more susceptible on being investigated? Or does the intense competition of its imports with Brazil's domestic industry leads to more trade-related injury suspicions and, consequentially, more antidumping initiations against the trade partner's industry? This correlation between trade balance, imports and antidumping rights usually happens when "a national authority's antidumping investigation places more weight on the criterion of injury to the domestic industry than it places on the criterion of dumping" (BOWN & CROWLEY, 2013, p. 53).

Our findings on tariff rates variable are at least 5% significant for all NB estimations. All results showed that a decrease in 1% of tariff rates is expected to imply a 1% increase on counts of antidumping investigations/revisions filled by Brazilian authorities. Results' magnitudes are, despite weak, similar for all three databases. This corroborates with the expected on the theoretical and empirical literature: there is a substitutability relation between

tariff rates (explicit protection) and antidumping investigations (TTB) in the Brazil's trade policy, caused by the necessity of protectionist-biased governments to protect their strategic industries (AGGARWAL, 2004; OLARREAGA & VAILLANT, 2011; BOWN AND CROWLEY, 2014; OLIVEIRA, 2014).

Considering that the GATT 1994 signature aimed reducing tariffs to promote trade, we can affirm that this objective was not completely met because of the concomitantly increase of TTB measures applied since the end of the 21st century. Therefore, Brazil's trade policy followed the paradoxical worldwide trend of increasing TTB policies applications after signing the GATT 1994.

Except for Tobit results concerning the variable "measures against BR" for developing countries, all other Tobit coefficients were convergent in signal and slightly higher in magnitude with their respective coefficients obtained from Poisson or/and NB coefficients. In IRR terms, the exception indicates that increases nearly 1 unit of AFF_{pt} leads to increases nearly 2 units of our dependent variable; in other words, for each investigation/revision opened against Brazilian imports by an emerging trade partner, local authorities tend to open 2 investigations against this same country. This result is in accordance with the ones found by Aggarwal (2004).

Considering that the retaliation strategy aims only specific trade partners (aims punishing only those that have applied rights considered unfair by the domestic authority), controlling this behavior for specific countries can be a more effective way to measure this effect (PRUSA & SKEATH, 2002). In accordance to that, Firme et al (2018) found that disaggregated models better capture the relation between antidumping filings and economic conditions. This disaggregation can be further studied to consider the behavior between Brazil and its trade partners that most fills investigations/revisions against it, like Argentina and China.

However, since AFF_{pt} does not show significance for any of our count data estimations, further studies in this matter are needed. Thus, this specific result will no longer be discussed in this work.

Summing up, Brazil's tend to initiate more antidumping investigations/revisions against trade partners that: (i) show better performance on industrial value added; (ii) are more exporter than importer, representing a negative weight on Brazil's trade balance, with higher probability if the partner is developed; and that (iii) faces less imports tariff rates imposed by the Latin American country. These results reinforce other empirical studies on the

conclusion that antidumping policies are not always being implemented within a price discrimination process.

Therefore, the main contribution of this study is providing more contributions to reinforce or dispel ideas that aim at reforming the both WTO rules and domestic TTB institutional puzzle. As previously said, considering the increasingly importance of productivity increases to sustain Brazil's economic growth in the next decades and the potential negative impact of the applications of biased TTB measures on the domestic industry competitiveness rates, these reforms are urgently necessary to increase domestic activity in satisfactory level.

The already identified loopholes on Brazilian TTB legislation, and empirical evidence of ambiguities regarding antidumping can be used to reduce deviations on local trade policy, creating some necessary, but not enough, conditions for sustainable growth for the country's economy.

TABLE 7 – RESULTS ON THE DETERMINANTS OF THE NUMBER OF ANTIDUMPING INVESTIGATIONS AND REVISIONS

	All countries				Developed				Developing			
Variables	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**
Industrial value	-6.062***	-5.270***	-7.872***	-2.386	-4.742	-2.544	-3.213	0.620	-8.459***	-6.270***	-8.714***	-4.654**
	(2.037)	(1.204)	(2.310)	(1.664)	(4.028)	(2.565)	(3.640)	(3.949)	(2.563)	(1.737)	(3.240)	(2.210)
Trade balance	-1.099***	-1.077***	-1.558***	-1.085***	-1.256**	-1.264***	-1.171**	-1.107	-1.076***	-1.133***	-1.638***	-1.146***
	(0.260)	(0.216)	(0.432)	(0.280)	(0.534)	(0.418)	(0.525)	(0.578)	(0.303)	(0.269)	(0.600)	(0.330)
Imports growth	-0.011	-0.031	-0.023	-0.026	0.087	0.003	0.039	0.093	-0.017	-0.036	-0.065	-0.054
	(0.074)	(0.064)	(0.099)	(0.080)	(0.147)	(0.116)	(0.120)	(0.147)	(0.084)	(0.076)	(0.137)	(0.102)
Imports share	8.095***	9.537***	30.93***	5.373***	-3.491	6.704***	13.25***	2.333	10.02***	10.78***	63.16***	6.950***
	(1.335)	(1.223)	(4.551)	(1.878)	(4.062)	(2.304)	(3.782)	(3.492)	(1.520)	(1.486)	(8.302)	(2.335)
Tariff	-6.252***	-4.673***	-5.076*	-6.229***	-6.871**	-8.390***	-7.020*	-8.016**	-4.445***	-3.103**	-2.714	-5.122***
	(1.501)	(1.353)	(2.777)	(1.668)	(3.398)	(2.981)	(4.160)	(3.578)	(1.677)	(1.534)	(3.421)	(1.904)
Measures against BR	-0.004	0.031	0.408	0.026	-0.151	-0.044	0.114	-0.058	0.120	0.145	0.922**	0.171
	(0.076)	(0.075)	(0.270)	(0.086)	(0.101)	(0.094)	(0.272)	(0.113)	(0.130)	(0.129)	(0.430)	(0.147)
LnConstant	-	-0.225	-	-	-	-0.351	-	-	-	-0.091	-	-
		(0.219)				(0.358)				(0.290)		
Constant	-	-1.230***	-3.048***	0.957***	-	-0.674*	-1.449***	1.832**	-	-1.477***	-3.839***	0.408
		(0.215)	(0.451)	(0.365)		(0.374)	(0.532)	(0.798)		(0.308)	(0.679)	(0.464)
Panel-level variance	-	-	1.638***	-	-	-	0.992***	-	-	-	1.738***	-
			(0.205)				(0.209)				(0.303)	
Overall variance	-	-	2.671***	-	-	-	1.955***	-	-	-	2.881***	-
			(0.127)				(0.142)				(0.183)	
Log-likelihood	-703.732	-880.493	-1027.309	-685.090	-304.454	-387.708	-440.326	-303.668	-390.150	-487.135	-561.976	-377.432
Wald χ^2	81.01	128.55	78.56	38	16.01	27.19	22.86	9.16	77.82	104.33	85.12	36.88
(Prob > χ^2)	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.000)	(0.000)	(0.164)	(0.000)	(0.000)	(0.000)	(0.000)
LR test of σ_v: χ^2	-	-	134.69	-	-	-	29.85	-	-	-	68.02	-
(Prob > χ^2)			(0.000)				(0.000)				(0.000)	
Hausman: Prob > χ^2	0.002		-	-	-		-	-	-		-	-
Observations	1245	1344	1344	1245	581	621	621	581	664	723	723	664
Left-censored obs.	-	-	1059	-	-	-	490	-	-	-	569	-
Uncensored obs.	-	-	285	-	-	-	131	-	-	-	154	-
Number of groups	57	62	62	57	27	29	29	27	30	33	33	30

Standard errors in parentheses. *** p<0.01; ** p<0.05;* p<0.1 SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

6 FINAL CONSIDERATIONS

Considering that dumping is an international trade price discrimination characterized as a non-compliance practice with the GATT 1994's non-discrimination principle of the trading system, countries can impose antidumping measures to protect their domestic industries. In specific, Brazil barely adopted antidumping measures until since the 1990's, when its application increased substantially because of trade opening, rises on economic activity and the signing of a new local trade legislation.

Thus, we analyzed the existence and the direction of macroeconomic variables that might be influencing on local antidumping policies decision-making in the context of this new legal institution, delimited by a bilateral study regarding all nations that filled antidumping investigations against Brazil or that where investigated by Brazilian authorities between 1995 and 2017. We also made a complementary discussion concerning the country's behavior relative to developed and developing partners.

Our dependent variables were specified by the counting of opened investigations and revisions: a non-negative integer count. Considering this, our results were obtained by Poisson and Negative Binomial models, the mostly used on empirical specifications regarding aspects of antidumping investigations/rights. Also, in order to address concerns about the right-skewed behavior of our dependent variables, we compared our results obtained with Tobit approach, a censored model estimation.

We found out that new legislation empowers local authorities to discretionally foreclose or impose antidumping applications, raising uncertainties on local trade defense system decision-process. Our results indicate that Brazil has been initiating antidumping measure with a protectionist bias. When its trade partner registers higher domestic industrial value added and/or less trade-dependency on Brazil's exports, it is more investigated than other countries. Also, countries that benefit from low tariff rates regarding their exports to Brazil can also face more cases opened against then by the Brazilian authorities. These results reinforce that Brazil not always applies TTB measures within a price discrimination process, demanding reforms on local trade defense legislation and procedures.

Reforms to reduce these uncertainties and properly adjust antidumping measures application and legislation in Brazil have becoming even more necessary in the coming years. In order to sustain economic development in the next decades, the country will need to improve productivity and constantly invest in efficiency advances, which can be partially achieved by properly reducing barriers to trade. Therefore, this study provides contributions

to reinforce or dispel ideas to reform the both WTO rules and domestic Brazil's trade policy institutional puzzle.

There are also evidence that Brazil's authorities deal differently with bigger and smaller trade partners when deciding on applying antidumping measures. Proportionally, more investigations have been opened against partners that have a higher share on Brazil's imports agenda, when compared with those less participative on Brazilian international trade. Further research is needed to corroborate this argument.

We also found indications that Brazil's authorities tend to initiate antidumping investigations against those trade partners that investigated local exporters at higher frequency. Brazil's legislation allows this occurrence since the same department, DECOM, investigates dumping possibly practiced against the domestic industry and concomitantly monitors initiations opened against local exporters. However, our results regarding count models were not robust on this, demanding further research in order to properly identify this potential retaliation behavior.

Finally, we also suggest further studies to verify the relation between disaggregated economic conditions and TTB measures initiations in Brazil. A sectorial-disaggregated model, for example, may identify if some specific industries are more/less susceptible to trade-protective measures by Brazilian authorities. And if trade barriers are more often applied on some industries than in others by a country, sectorial public policies may be designed to avoid the indiscriminate adoption of these measures.

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APPENDIX 1 – COUNTRIES INCLUDED AND DEVELOPMENT STATUS

TABLE 8 – LIST OF COUNTRIES INCLUDED IN THE STUDY BY DEVELOPMENT STATUS

Status	Country	Status	Country
Developed	Australia	Developing	Bosnia and Herzegovina
Developed	Austria	Developing	Chile
Developed	Belgium	Developing	China
Developed	Bulgaria	Developing	Colombia
Developed	Canada	Developing	Costa Rica
Developed	Chinese Taipei (Taiwan)	Developing	Cuba
Developed	Croatia	Developing	Ecuador
Developed	Denmark	Developing	Egypt, Arab. Rep.
Developed	Estonia	Developing	Hungary
Developed	European Union[30]	Developing	India
Developed	Finland	Developing	Indonesia
Developed	France	Developing	Kazakhstan
Developed	Germany	Developing	Korea, Dem. Rep.
Developed	Greece	Developing	Macedonia, FYR
Developed	Hong Kong	Developing	Malaysia
Developed	Israel	Developing	Mexico
Developed	Italy	Developing	Pakistan
Developed	Japan	Developing	Paraguay
Developed	Korea, Rep.	Developing	Peru
Developed	Netherlands	Developing	Poland
Developed	New Zealand	Developing	Romania
Developed	Portugal	Developing	Russian Federation
Developed	Singapore	Developing	Saudi Arabia
Developed	Slovenia	Developing	South Africa
Developed	Spain	Developing	Thailand
Developed	Sweden	Developing	Turkey
Developed	Switzerland	Developing	Ukraine
Developed	United Kingdom	Developing	United Arab Emirates
Developed	United States of America	Developing	Uruguay
Developing	Argentina	Developing	Venezuela
Developing	Bahrain	Developing	Vietnam
Developing	Bangladesh	Developing	Yugoslavia, FR

SOURCE: elaborated by the author, based on IMF (2016).

[30] For simplification purposes and since there are antidumping measures applied by Brazilian authorities against Europeans countries and the European Union separately, the trade bloc was considered as a separated country for this study.

APPENDIX 2 – CORRELATION MATRICES

TABLE 9 – CORRELATION MATRIX: ALL COUNTRIES DATABASE

	Antidumping	Industrial value	Trade balance	Imports growth	Imports share	Tariff	Measures against BR
Antidumping	1	-	-	-	-	-	-
Industrial value	-0.1685	1	-	-	-	-	-
Trade balance	-0.1036	0.0583	1	-	-	-	-
Imports growth	-0.0227	-0.0234	0.0337	1	-	-	-
Imports share	0.3692	0.0429	-0.1910	-0.0589	1	-	-
Tariff	0.0277	0.2129	-0.0552	-0.0610	0.0418	1	-
Measures against BR	0.1428	0.0575	-0.0348	-0.0366	0.3248	-0.0720	1

SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

TABLE 10 – CORRELATION MATRIX: DEVELOPED COUNTRIES DATABASE

	Antidumping	Industrial value	Trade balance	Imports growth	Imports share	Tariff	Measures against BR
Antidumping	1	-	-	-	-	-	-
Industrial value	-0.0962	1	-	-	-	-	-
Trade balance	-0.1330	0.3349	1	-	-	-	-
Imports growth	-0.0286	0.0125	0.0286	1	-	-	-
Imports share	0.4020	-0.0084	-0.1014	-0.0574	1	-	-
Tariff	-0.0206	-0.1497	-0.0595	-0.0758	0.0342	1	-
Measures against BR	0.3068	0.0432	-0.0242	-0.0378	0.3737	-0.1212	1

SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

TABLE 11 – CORRELATION MATRIX: DEVELOPING COUNTRIES DATABASE

	Antidumping	Industrial value	Trade balance	Imports growth	Imports share	Tariff	Measures against BR
Antidumping	1	-	-	-	-	-	-
Industrial value	-0.1811	1	-	-	-	-	-
Trade balance	-0.1300	0.1799	1	-	-	-	-
Imports growth	-0.0253	0.0024	0.0116	1	-	-	-
Imports share	0.5924	-0.1340	-0.2467	-0.0567	1	-	-
Tariff	0.0510	0.2338	0.0239	-0.0434	-0.024	1	-
Measures against BR	0.0841	0.0730	-0.0411	-0.0378	0.2563	-0.0574	1

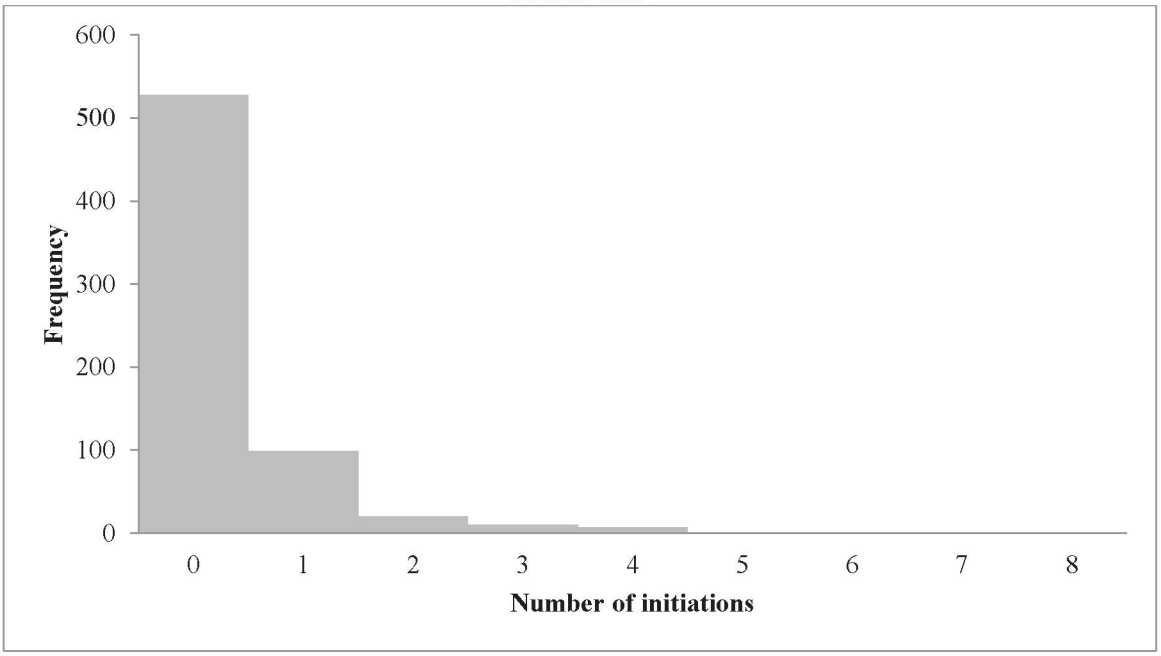
SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

APPENDIX 3 – HISTOGRAMS OF THE DEPENDENT VARIABLES

FIGURE 5 – NUMBER OF ANTIDUMPING INVESTIGATIONS AND REVISIONS ANNUALLY OPENED BY THE BRAZILIAN AUTHORITIES PER TRADE PARTNER (1995–2017): ALL COUNTRIES DATABASE

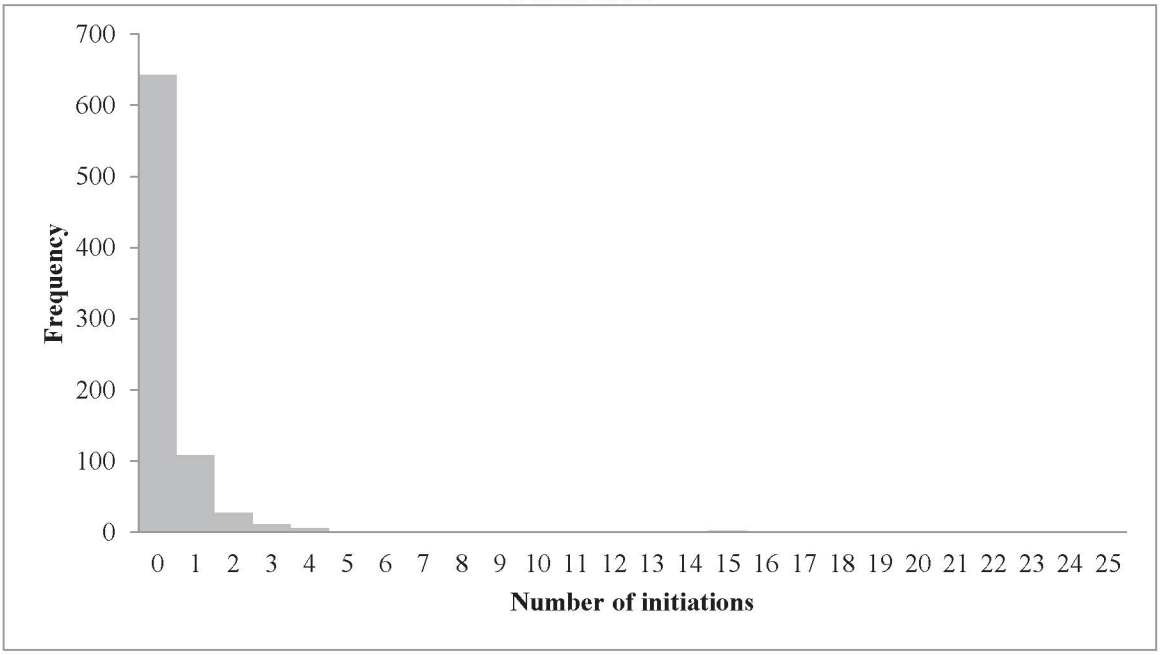
SOURCE: elaborated by the author, based on MDIC (2018b).

FIGURE 6 – NUMBER OF ANTIDUMPING INVESTIGATIONS AND REVISIONS ANNUALLY OPENED BY THE BRAZILIAN AUTHORITIES PER TRADE PARTNER (1995–2017): DEVELOPED COUNTRIES DATABASE



SOURCE: elaborated by the author, based on MDIC (2018b).

FIGURE 7 – NUMBER OF ANTIDUMPING INVESTIGATIONS AND REVISIONS ANNUALLY OPENED BY THE BRAZILIAN AUTHORITIES PER TRADE PARTNER (1995–2017): DEVELOPING COUNTRIES DATABASE



SOURCE: elaborated by the author, based on MDIC (2018b).

APPENDIX 4 –RESULTS IN TERMS OF INCIDENCE-RATE RATIOS AND MARGINAL EFFECTS

TABLE 12 – INCIDENCE-RATE RATIOS, FOR POISSON AND NB MODELS, AND PREDICTIVE MARGINAL EFFECTS, FOR TOBIT, RESULTS ON THE DETERMINANTS OF ANTIDUMPING INVESTIGATIONS AND REVISIONS

	All countries				Developed				Developing			
Variables	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**	**FE Poisson**	**RE Poisson**	**Tobit**	**NB**
Industrial value	0.002***	0.005***	-1.485***	0.091	0.008	0.078	-0.639	1.859	0.0002***	0.001***	-1.625***	0.009**
	(0.004)	(0.006)	(0.459)	(0.152)	(0.035)	(0.201)	(0.730)	(7.343)	(0.0005)	(0.003)	(0.640)	(0.210)
			[-0.616]				[-0.181]				[-0.099]	
Trade balance	0.333***	0.340***	-0.293***	0.337***	0.284**	0.282***	-0.233**	0.330	0.341***	-0.321***	-0.305***	0.317***
	(0.086)	(0.073)	(0.085)	(0.094)	(0.152)	(0.118)	(0.107)	(0.191)	(0.103)	(0.086)	(0.117)	(0.104)
			[0.173]				[0.426]				[0.286]	
Imports growth	0.988	0.968	-0.004	0.974	1.090	1.003	0.007	1.097	0.983	0.964	-0.012	0.947
	(0.073)	(0.062)	(0.018)	(0.078)	(0.160)	(0.116)	(0.023)	(0.160)	(0.083)	(0.073)	(0.025)	(0.097)
			[0.302]				[0.204]				[0.385]	
Imports share	3276.683***	13863.92***	5.835***	215.403***	0.030	815.324***	2.638***	10.307	22513.91***	47860.72***	11.781***	1043.269***
	(4374.302)	(16952.87)	(1.078)	(404.501)	(0.123)	(1878.64)	(0.797)	(35.992)	(34217.54)	(71101.08)	(2.387)	(2436.045)
			[0.018]				[0.266]				[0.010]	
Tariff	0.001***	0.009***	-0.957*	0.001***	0.001**	0.0002***	-1.398*	0.0003**	0.011***	0.044**	-0.506	0.005***
	(0.002)	(0.126)	(0.535)	(0.003)	(0.003)	(0.0006)	(0.847)	(0.001)	(0.019)	(0.068)	(0.644)	(0.011)
			[0.099]				[0.111]				[0.090]	
Measures against BR	0.995	1.032	0.077	1.026	0.859	0.956	0.022	0.943	1.127	1.155	0.172**	1.186
	(0.075)	(0.062)	(0.051)	(0.089)	(0.086)	(0.190)	(0.054)	(0.106)	(0.146)	(0.149)	(0.084)	(0.174)
			[0.572]				[0.062]				[0.052]	
LnConstant	-	-0.225	-	-	-	-0.351	-	-	-	-0.091	-	-
		(0.219)				(0.358)				(0.290)		
Constant	-	0.798***	-	2.603***	-	0.704*	-	6.245**	-	0.912***	-	1.504
		(0.174)		(0.950)		(0.251)		(4.981)		(0.264)		(0.698)
Observations	1.45	1344	1344	1.245	581	621	621	581	664	723	723	664
Left-censored obs.	-	-	1.059	-	-	-	490	-	-	-	569	-
Uncensored obs.	-	-	285	-	-	-	131	-	-	-	154	-
Number of groups	57	62	62	57	27	29	29	27	30	33	33	30

Standard errors in parentheses. Means in square brackets. *** p<0.01; ** p<0.05;* p<0.1 SOURCE: elaborated by the author, based on WB (2018a, 2018b) and MDIC (2018b, 2018e).

ANNEX 1 – THE "RECIPROCAL DUMPING MODEL"

The seminal article regarding the original "Reciprocal Dumping Model" was published by Brander and Krugman (1983). This annex is based on Shy's (1996) simplification of the original model, assuming costless production.

Suppose that there are two identical countries indexed by $k = 1, 2$. Assuming Q_k as the total output of local production and imports in country k, each country has a demand function given by:

$$p_k(Q_k) = a - bQ_k, \tag{14}$$

Although the costless production, cost regarding transportation of goods traded between countries, given by t, is strictly positive and paid by the exporting firms. Consider q_k the production at firm k-level, which is decomposed into local sales, q_k^h, and foreign sales, q_k^f. Thus, the production level of firm k is given by:

$$q_k = q_k^h + q_k^f. \tag{15}$$

Hence, production and imports summation in countries 1 and 2, Q_1 and Q_2, is given by:

$$Q_1 = q_1^h + q_2^f, \text{ and} \tag{16}$$

$$Q_2 = q_2^h + q_1^f. \tag{17}$$

The profit-maximization will be based on the following profit functions:

$$\pi_1 = p_1(Q_1)q_1^h + p_2(Q_2)q_1^f - tq_1^f, \text{ and} \tag{18}$$

$$\pi_2 = p_2(Q_2)q_2^h + p_1(Q_1)q_2^f - tq_2^f. \tag{19}$$

Solving the problem, the first-order conditions for firm 1 are:

$$0 = a - 2bq_1^h - bq_2^f \tag{20}$$

$$0 = a - 2bq_1^f - bq_2^h - t, \tag{21}$$

and for firm 2 are:

$$0 = a - 2bq_2^h - bq_1^f \tag{22}$$

$$0 = a - 2bq_2^f - bq_1^h - t. \tag{23}$$

Given that both conditions for each firm are independent, it is possible to isolate each q_k exclusively as a function of a, b and t. As so, we have, for firm k:

$$q_k^h = (a + t)/3b, \tag{24}$$

$$q_k^f = (a - 2t)/3b, \tag{25}$$

$$Q_k = (2a - t)/3b, \text{ and} \tag{26}$$

$$p_k = (a + t)/3. \tag{27}$$

Therefore, in this model, domestic and foreign sales vary accordingly to transportation cost. When feasible, both firms will cross-subsidize cost *t*: charging lowering export prices and rising domestic prices until they reach the same value.

Transportation cost could be saved, and lower equilibrium prices p_k could be charged, if each firm decided selling only domestically. In this case, however, firms do not trade only when *t* is not feasible.